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THE SPECIES OF *PHYLLOTRETA* NORTH OF MEXICO

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The species of the genus *Phyllotreta*¹ occurring in America north of Mexico have not hitherto received serious study, nor have they been diligently collected. Prior to 1873 only two species, the Fabrician *bipustulata* and *vittata*, were recognized in this country. At about that time Crotch added five new species and Leconte described three. In 1889, in Horn's revision, 15 species were considered (omitting *picta*²), four being described as new. Still later Dury and Schaeffer each described a new species and the writer has added three, one new to science. In Europe 37 species are catalogued, many of them so closely related as not to be easily distinguished without most careful study. When all of the forms occurring in our fauna have received proper attention, the list will probably exceed that.

The genus *Phyllotreta* was defined by Foudras in 1859, but was evidently used, presumably as a manuscript name, by Chevrolat much earlier.³ *Ph. armoraciæ*, being the first species mentioned, both in the catalogue and by Foudras, would naturally be the type.

¹ Order Coleoptera; family Chrysomelidae; subfamily Halticinae.

² Not *Phyllotreta*, but *Trachymetopa* Weise (L. G. Gentner in lit.).

³ Chevrolat, *In Catalogue Coleoptera Dejean*, 1833 (1836), p. 391.

Following the law of priority of publication, Dejean should be credited with the generic name.

PHYLLOTRETA Dejean

Phyllotreta Dejean, Cat. Col., ed. 3, 1833 (1836), p. 391.

Phyllotreta Foudras, Ann. Soc. Linn. Lyon, ser. 2, 1859, p. 230; Leconte, Proc. Am. Phil. Soc., 1878, p. 615; Horn, Trans. Am. Ent. Soc., 1889, pp. 292, 293.

Phyllotrata (Chevrolat), Stephens, Man. Brit. Coleop., 1839, p. 291.

Orchestris Kirby, Fauna Boreali-Americana, 1837, p. 217; Crotch, Proc. Acad. Nat. Sci. Phila., 1873, p. 65; Leconte, Proc. Am. Phil. Soc., 1878, p. 614.

Head small, deeply inserted in the thorax; eyes convex, prominent; front distinctly carinate between the antennae. Last joint of maxillary palpi as long as the preceding, elongate conical. Antennae half as long as the body, sometimes slightly longer or shorter, slender, the apical joints wider than the basal ones (omitting the wide first joint), in many species different in the sexes in the form of the basal joints, especially in the fifth and frequently the fourth and sixth. Prothorax transverse, narrower at the apex; apex not emarginate; base very slightly arcuate. Prosternum narrowly separating the coxae, slightly dilated behind them; coxal cavities open posteriorly, angulate externally, exposing the trochanter. Elytra oval, moderately convex; humeri seldom prominent. Legs moderate in length, posterior femora stout, posterior tibiae narrow, gradually broader to the apex, not sulcate on the outer edge, although slightly excavate near the apex. Posterior tarsi shorter than the tibiae, first joint about one-third the length of the tibia and equal to the other three; claws simple.

The species of our fauna are of small size, varying from about 1.5 to 3.5 mm. in length, usually elongate oval in outline, the length approximately twice as long as the width. Less than half are ornamented with a yellow or whitish longitudinal vitta on each elytron, three forms are spotted, and one, the imported *armoraciae*, is mostly yellow, while the remainder are unicolorous or nearly so. It is obvious that the forms with two spots on each elytron were originally vittate and that the vittae are merely interrupted near the middle, since many individuals, notably in *vittata*, bear evidence in the more or less narrow lines, sometimes partially obliterated, connecting

these vittae. The body is usually moderately convex but sometimes depressed, as in *pusilla* and *prasina*.

It is the purpose of this paper to present as concise an account of the species of the genus *Phyllotreta* occurring north of Mexico as will enable the student of the group to identify them. At the same time their known geographical distribution is indicated, together with such data as are available in regard to their food habits.

The study of all species available enables the writer to amplify the generic description as previously published.⁴

The head has usually above the antennae a short interocular fovea or impressed line extending as far as the top of the eyes, but this character is too frequently obsolete or absent to be of definite value for purposes of classification. The eyes exhibit only a moderate degree of variation, from species in which they are comparatively large and prominent to others where they are relatively small or inconspicuous.

The simplest form of antennae are those in which the sexes are alike, as in the eastern *armoraciae* and *bipustulata* and in the western *ramosa*, *aeneicollis* and *pusilla*. The first joint is always wide and long, but usually less than twice as long as the second and third together. The second joint is generally wider at the base than the third and fourth. The third and fourth are, as a rule, subequal in length and width, but in the male the fourth, fifth and sixth are apt to be quite variable in their proportions, as has been previously stated. A more complex form of antennae occurs in the species where the fifth joint ♂ is more or less enlarged. When this joint is strongly inflated, it is usually longer as well, in which case the sixth joint is correspondingly small, as in such species as *denticornis* and *zimmermanni*, where it is extremely short, and in others like *oregonensis*, *utana* and *liebecki*, where it is a little larger. Other extremes in antennal development are exemplified in *denticornis*, where the lower angle of the sixth joint is prolonged into an acute process, and *robusta*, in which the apical free angle of the fifth joint is prolonged.

The prothorax and elytra exhibit moderate variation in the different species, such differences taking the form of relative convexity, length, width, degree of lateral arcuation, and punctation. In this connection two hitherto undescribed species may be mentioned as distinctly shorter and of more robust form than any others, namely

⁴ A single species, *Ph. ulkei* Horn, is the only one that has not been examined.

obtusa and *transversoalis*. *Ph. chalybeipennis* is remarkable for the dual nature of the elytral punctation, extremely large punctures intermingled with much smaller ones.

The pygidium is normally covered (in dried specimens) by the elytra, but in some species, e.g., *lewisii*, it is sometimes exposed on the dorsal surface. Here it is seen to be distinctly covered with piliferous punctures, the pile being very delicate and gray. On the ventral surface the pygidium is frequently strongly inflexed, in some males of certain species, e.g., *chalybeipennis*, *pusilla*, *herbacea* and others, forming with the extreme apex of the fifth segment a semicircular concavity.

The ventral surface exhibits many important characters, especially in the last segment. The punctation of the first ventral segment is not always so dissimilar to that of the fifth, and the second, third and fourth, as a general rule, each bears a single row, sometimes a partial second, of punctures, which in turn bear each a single fine hair, usually most apparent on the sides of the last segments.

In the male the fifth segment at the sides is usually more or less impressed, this impression sometimes becoming distinctly concave. Exceptionally, the concavity extends across the segment. The middle, at least in the apical half, is usually impressed in varied shapes and lengths, sometimes concavely as in *bipustulata*, sometimes taking the form of a simple impressed line, occasionally subtriangular at the extreme apex, as in *pusilla*, or this impression may be present at the base of the segment and not extend to the apex as in *chalybeipennis*. Finally, in many species there is at each side of the apex a tubercle of variable outline and size, usually when strongly developed more or less transverse, as in *armoraciae*, *zimmermanni*, *chalybeipennis* and others. The tubercles tend to obliteration in some specimens.

A study of the primary male sexual characters by dissection might be of assistance in the determination of the status of some uncertain forms, whether species or variants. This, however, would entail additional specimens, and with such material at command their study might solve the problem beyond reasonable doubt, although study of the internal characters might serve as confirmation of an expressed opinion. In the female the fifth segment is, as a general rule, simple, but it is impressed at the sides in exceptional specimens and species. The apex of this segment is frequently more acute than in the male, and the extreme apex is sometimes more or less feebly impressed, and in some exceptional individuals of a species it may be distinctly impressed.

The species of *Phyllotreta* are practically confined to the Cruciferae as food plants, although certain ones also attack the Capparidaceae and Resedaceae, closely related botanical families. The commoner forms are injurious, the principal injury being due to the beetles destroying the cotyledons and seedlings of such crops as cabbage, turnip, radish, mustard, horse-radish, cress, and the like. On older plants the work of the beetles varies according to the nature of the vegetation attacked. On the foliage of plants like cabbage, when of considerable growth, they eat out small pits, usually from the lower surface of the outer leaf, and this form of injury, although obvious, is not, as a general rule, serious. In the case of thin-leaved plants, such as turnip, radish and mustard, the foliage attacked becomes riddled with minute holes, and dries, thus lessening the yield. When the plants are young and the growing conditions are unfavorable, severe injury may be accomplished by the beetles. Such pernicious species as *Ph. pusilla* and *vittata* in some years severely injure cole crops, destroying entire plantings, and damage is particularly severe in seed beds. The former species, when especially numerous, attacks various vegetable crops, and the latter sometimes feeds to a slight extent on plants not related to the Cruciferae.

The larvae, as a general rule, live on the roots or mine the leaves of cruciferous weeds, and both root-feeders and leaf-miners not infrequently attack cultivated crucifers.

Among North American species that are more or less periodically injurious are *armoraciae*, *oregonensis*, *zimmermanni*, *vittata*, *ramosa*, *bipustulata*, *albionica*, *decipiens*, *aneicollis*, *pusilla* and *areae*. All of our species are believed to be native with the exception of *armoraciae*, *vittata*, and *areae*, three forms introduced from Europe.

In the Old World there are several other *Phyllotretas* known to attack cruciferous crop plants, the list including the common European *nemorum*, *exclamationis*, *undulata*, *cruciferae*, *nigripes*, *atra*, *consobrina*, *variipennis* and *vittula*. There is not only danger of the introduction of these into the United States and Canada, but it is surprising that some have not already found a foothold here. Even other foreign species of the genus not recorded as pests abroad might be troublesome if introduced. The same is true of many, if not most of our common native forms, should they become attracted to cultivated crucifers through the loss by cultivation of their wild food plants or other cause and be permanently introduced into other regions. Of such are *liebecki*, *herbacea*, *prasina*, *laticornis*, and possibly *robusta*, *inconspicua* and *columbiana*.

The unicolorous species, *i. e.*, those without vittae or spots, in which the fourth and fifth antennal joints are similar in the sexes, are difficult of definition and of separation by means of tables. Where the antennal joints are so nearly uniform in length, some individual difference must be expected, and in small series some difficulty may be experienced in the detection of such characters as the minute apical tubercles in the last ventral segment. While many of these species are quite distinct, at least an equal number are very closely related to some similar one. With a good series of specimens and species available, however, it is hoped that the tables submitted may be found useful.

In writing of the Halticini in 1889,⁵ Doctor Horn remarked, "The entire tribe is one which presents many difficulties in its study. The characters of taxonomic importance are few, and these are so often interlinked as to make it almost impossible to decide to which priority of importance should be given." Doctor Horn might have gone much further in the discussion of some of the genera and especially of *Phyllotreta*. Great difficulty is experienced in separating the females of some species from related ones, and even in separating the males from the females of a given species, and there is an almost utter lack of uniformity in the case of the structure of the fifth ventral segment in the males of such common species as *pusilla*, while the equally common *vittata* presents characters which are almost baffling without minute study of a large series.

In the preparation of the present paper the writer has had access to the collection of the U. S. National Museum, including the recent bequest of Col. Thomas L. Casey, and to a reference collection of the Bureau of Entomology. He is especially indebted to Dr. J. McDunnough for the loan of the collection of the National Museum of Canada, and to Dr. Nathan Banks for material from the Museum of Comparative Zoology, of Cambridge, Mass.; also to L. L. Buchanan, F. S. Carr, N. Criddle, Prof. R. A. Cooley, D. K. Duncan, Dr. C. P. Gillette, Ralph Hopping, M. C. Lane, J. B. Wallis, Prof. H. F. Wickham, and Dr. E. C. Van Dyke, and to others who will be mentioned in connection with the descriptions of the various species.

Statement is duly made where a new species is described from a single specimen or from a single sex represented by more than one specimen. In cases where no remarks are made, it may be assumed that the amount of material of each species available was deemed sufficient for the purpose of description, and that the holotypes, as

⁵ Trans. Amer. Ent. Soc., Vol. XVI, 1889, p. 165.

also the allotypes, where described, are deposited in the U. S. National Museum unless otherwise stated.

TABLES

Our North American species of *Phyllotreta* may be conveniently divided into two main groups or divisions, as follows:

Elytra cream-colored or with yellowish stripes or spots.....Table A
Elytra without vittae or large spotsTable B

TABLE A

Elytra cream-colored or with yellowish stripes or spots

Elytra cream-colored with narrow black sutural stripe.

Antennal joints of ♂ subequal, fifth not inflated; Northern U. S., Canada, Northern Europe I. 1. *armoraciae* Koch

Elytra black, each with a median yellow vitta or stripe.

Fifth antennal joint of ♂ notably enlarged and thickened II. *lepidula* group

Fifth antennal joint of ♂ feebly or not at all enlarged III. *alberta* group

Elytra black, each with one or two yellow or reddish spots IV. *bipustulata* group

II. LEPIDULA group

Elytra each with a median yellow vitta. Fifth antennal joint of ♂ notably enlarged and thickened

Elytral vittae without branches, narrow.

Surface highly polished, vittae distinct, nearly as in *Systema*; Calif. 2. *lepidula* Lec.

Elytral vittae not sinuous, each with one or two branches.

Vittae wide, dilated at both ends, not constricted at middle.

Vitta at middle about as wide as space between it and suture.

Antennal joints ♂ 4 and 5 black, greatly enlarged, 5 not prolonged; length 1.8-3.0 mm.; Northwest U. S., Colo., Kans., Tex. 3. *oregonensis* Horn

Antennal joint ♂ 4, 5 yellow, 4 not greatly enlarged, 5 more enlarged, apically produced; length 1.5-2.5 mm.; Northwest U. S., Colo., Wis., Ind. ... 4. *robusta* Lec.

Vittae narrow, distinctly sinuous, not noticeably widened at the ends.

Vittae subparallel at base only, strongly incurved apically.

Antennal joints ♂ 4, 5 black, 5 greatly enlarged, concave on lower surface, 4 much smaller; vitta branched at both ends; length 2.5 mm.; Atlantic States, Can.

5. *zimmermanni* Cr.

Antennal joints ♂ 4, 5 yellow, both greatly enlarged, 5 flat; vitta branched only at base; length 2.5-3.0 mm.; Utah, Nev., Oreg.

6. *utana* Chhtn.

Vittae irregular in width, more or less distinctly constricted at middle and incurved toward suture at either end, not branched apically.

Vittae strongly incurved at base, not reaching suture toward apex; legs dark; length 1.8-2.0 mm.; N. Amer., Eur.

7. *vittata* Fab.

Vittae feebly incurved at base, attaining suture at apex; legs yellow; length 1.6-1.8 mm.; Fla.-Tex.

8. *liebecki* Schf.

III. ALBERTA group

Fifth antennal joint ♂ feebly or not at all enlarged

Fifth antennal joint ♂ and ♀ about as long as 3 and 4 together.

Form elongate oval.

Vittae moderately, nearly uniformly wide, distinctly sinuous, abruptly constricted near middle, distinctly branched at both ends.

Prothorax moderately coarsely and sparsely punctate; length 2.4 mm.; Alberta, Can.

9. *alberta* n. sp.

- Vittae nearly uniformly narrow, moderately sinuous, somewhat feebly branched at the ends.
- Prothorax finely, distinctly and densely punctate; Oreg. 10. *perspicua* n. sp.
- Form oblong oval, less than twice as long as wide.
- Vittae very narrow, sinuous, humeral branch short, apical branch not distinct; length 1.6 mm.; Colo. 11. *obtusa* n. sp.
- Fifth antennal joint ♂ short, not as long as 3 and 4 together.
- Vittae strongly constricted at middle with distinct branches each end.
- Vittae wide, parallel with suture on inner margin, not distinctly incurving at base, wide and not appendiculate at apex; length 2.4 mm.; Alberta, Can. 12. *oblonga* n. sp.
- Vittae narrow and sinuous, humeral branch short, apical one appendiculate; length 1.8-2.0 mm.; Calif., Nev. 13. *ramosa* Cr.

IV. BIPUSTULATA group

Elytra each with one or two yellow or reddish spots

Elytra each with two yellow or reddish spots.

Fifth antennal joint ♂ inflated, in ♀ not inflated.

Elytral spots wide, light yellow, subapical one incurved; Southern States, Eur.

7b. *vittata discedens* Weise

Elytral spots narrow, reddish or dark yellow, subapical incurved; Northern States, Alaska, Can.

7c. *vittata lineolata* n. var.

Fifth antennal joint ♂ not inflated as in ♀.

Elytral spots large, yellow, subapical one not incurved; North-eastern U. S., Can.

14. *bipustulata* Fab.

Elytra each with only one small, more or less indistinct reddish subapical spot or exceptionally with a similar subhumeral spot; elytral punctures serial; Nev., Mont., Idaho, Calif. 18a. *decipiens ordinata*
n. var.

TABLE B

Elytra unicolorous, without vittae or large spots

Fifth antennal joint of ♂ distinctly wider than adjacent joints V. *denticornis* group
Fifth antennal joint of ♂ and ♀ similar, not wider than other joints... VI. *chalybeipennis* group

V. DENTICORNIS group

*Elytra without vittae or each with a single small spot
Antennal joints 4 and 5 dilated, 7-11 generally wider
than preceding*

A. Black, without metallic luster.

Antennae ♂ with joints 4 and 5 much dilated, 5 longer and more strongly dilated, length 2.2-2.5 mm.

Form elongate oval. Lower angle ♂ antennal joint 6 very short, prolonged in an acute process; Calif., Oreg. 15. *denticornis* Horn

Form ellipsoid oval, slender. Lower angle ♂ antennal joint 6 suboblong, subequal to 7 in length, not prolonged; Wash. ... 16. *amplicornis* n. sp.

Form oblong oval, robust. Antennal joints 1-3 pale, 6 equal to 4; legs reddish brown; Ohio... 17. *ulkei* Horn

Antennae ♂ with joint longer than others, but less strongly dilated; distinctly convex, coarsely punctate; prothorax nearly twice as wide as long; length 1.8 mm.

Elytral punctures not, or somewhat indistinctly, serially arranged, subapical red spot more or less constant; Pacific States, Colo., Western Canada... 18. *decipiens* Horn

B. Aeneous, green, or black with metallic luster. Feebly convex, finely punctate, prothorax less than one-third wider than long.

Fifth antennal joint of ♂ one-third wider to twice as wide as fourth.

Fourth ventral segment of ♂ distinctly wider than 3; 5th deltoïd.

Ventral segments especially ♀ all with distinct gray pile. General color black or dark aeneous; Western U. S.

19. *albionica* Lec.

Fourth ventral segment of ♂ subequal in width to preceding.

Ventral segments ♀ with less distinct, more setiform hairs.

Fifth antennal joint of ♂ elongate oval, second shorter than third.

Body metallic dark green; Colo.

20. *herbacea* n. sp.

Ventral segments ♀ feebly gray pilose.

Fifth antennal joint of ♂ very feebly dilated.

Body green, bronze or black; Southern Calif., Southern Tex., Ariz.

21. *prasina* n. sp.

Subgroups of *chalybeipennis* group

Antennal joints 4 and 5 similar in the sexes, not dilated

Antennal joint 5 very little longer than 4 or 6.

Fifth ventral segment with tubercles each side of apex in ♂ only.

Elytral punctures of two distinct sizes; colors bright blue, green, purple or aeneous.

chalybeipennis subgroup

Elytral punctures equal and uniform

lewisii subgroup

Fifth ventral segment ♂ and ♀ with tubercles at apex

pusilla subgroup

Antennal joint 5 more distinctly longer than preceding.

Fifth ventral segment without tubercles *viridicyanea* subgroup

chalybeipennis subgroup

Elytral punctures of two distinct sizes, larger with tendency to form striae; colors bright blue, green, purple or aeneous, basal antennal joints yellowish.

Elytra with small punctures interspersed with very large ones; length 2.3-2.8 mm.; Atlantic sea-coast 22. *chalybeipennis* Cr.

Elytral punctures not so diverse in size; length 1.2-2.0 mm.; Colo., Kans., La., Tex. 23. *aeneicollis* Cr.

lewisii subgroup

Elytral punctures equal and uniform

A. Body elongate oval, about twice as long as wide.

a. Form depressed or subdepressed. Antennae more than half as long as the body.

Dorsum notably blue or greenish, exceptionally black.

Elytral punctation without serial tendency; length 2.0-2.7 mm.; Western U. S. 24. *lewisii* Cr.

Antennae approximately half as long as the body.

Antennae fully half as long as the body.

Dorsum and prothorax with distinct green luster; elytra dark blue.

Elytral disc with decided tendency to serial punctation; length 1.8-2.3 mm.; B. C., Can. 25. *columbiana* n. sp.

Antennae less than half as long as the body.

Head with small eyes, not prominent; prothorax short; elytra long and slender.

Fifth ventral segment ♂ flat at apex; Southern Calif., N. Mex., Nev.

26. *subnitida* n. sp.

Antennae very slender, slightly more than half as long as the body.

Head with large eyes, prominent; prothorax large; elytra rather shorter.

Fifth ventral segment ♂ transversely concave at middle; N. Y., Eur.

27. *aerea* All.

b. Form convex.

Antennae less than half as long as the body; joints 7-11 gradually and strongly widened to apex.

Dorsum entirely with faint metallic luster.

Prothorax not deeply punctate, elytra not serially punctate; length 1.3-1.5 mm.; Western Can., Wash.

28. *inconspicua* n. sp.

Antennae a little more than half as long as the body, slender, joints 7-11 scarcely wider.

Prothorax rather strongly arcuate at the sides.

Dorsum brightly shining black with metallic luster; Southern Calif., Ariz., Colo., N. Mex.

29. *fulgida* n. sp.

B. Body short oval, less than twice as long as wide.

Prothorax large, distinctly densely punctate; antennae very slender.

Fifth ventral segment ♂ with a large transverse oval concavity; body blue black with faint luster; Utah

30. *transversoalis* n. sp.

- Fifth ventral segment ♂ flat at apex; body with prothorax aeneous green, elytra black without color luster, length 1.7 mm.; Manitoba, Can. 31. *brevipennis* n. sp.

pusilla subgroup

Fifth ventral segment ♂ and ♀ with tubercles at apex

- Body depressed, elongate subovate; prothorax very narrow, ventral segments not or feebly rugose; fifth ventral ♂ narrowly flattened at apex; Western U. S. 32. *pusilla* Horn

- Body convex, elongate oval; prothorax wide, ventral segments strongly rugose; fifth ventral ♂ narrowly transversely concave; Ariz. 33. *laticornis* n. sp.

viridicyanea subgroup

Antennal joint 5 more distinctly longer than preceding ones

Fifth ventral segment without tubercles at apex in either sex

- Antennal joint 5 of ♂ nearly as long as 3 and 4 together, metallic green, basal joints of antennae bright yellow or red; Calif. 34. *viridicyanea* n. sp.

- Antennal joint 5 of ♂ only one-fourth to one-third longer than 3; elytra polished or varnished black.

Dorsum strongly but finely punctate; elytra with metallic luster.

- Fifth ventral segment ♂ with a large deep deltoid concavity at apex; Oreg., Utah 35. *polita* n. sp.

Dorsal punctation feeble; elytra without metallic luster.

- Fifth ventral ♂ with small distinct circular concavity at apex; Tex. 36. *inordinata* n. sp.

1. *Phyllotreta armoraciae* (Koch) (Fig. 1)

Haltica armoraciae Koch, Entom. Hefte, v. 2, 1803, p. 75.

Haltica vittata Stephens, Mandibulata, v. IV, 1831, p. 297.

Phyllotreta armoraciae Koch, in Erichson, Naturw. Ins. Deut., v. 6, 1893, pp. 865, 866; Chittenden, Insect Life, v. VII, 1895, pp. 404-406; Chittenden & Howard, N. F., Bul. 535, 1917, pp. 1-16; Chittenden, Proc. Ent. Soc. Wash., 1923, p. 139.⁶

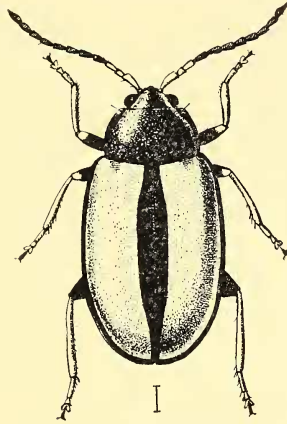


Fig. 1.—*Phyllotreta armoraciae* ♂ The horse-radish flea-beetle, highly magnified.

Elongate oval, strongly convex, black, shining; elytra cream-colored or buff with a black sutural stripe. Antennae half as long as the body, three basal joints yellow. Head finely sparsely punctate. Prothorax one-fourth wider than long, much wider at apex than head, moderately arcuate at the sides; disc rather coarsely and sparsely punctate. Elytra cream-colored or buff, wider at base than the prothorax, humeri rounded, umbone not prominent, anterior two-thirds of sides subparallel, posterior arcuate; disc with a narrow sutural black stripe, widened at the middle, a marginal thin black stripe each side; surface finely punctate, punctures not deep, rather dense. Ventral segments shining black, punctate, fifth strongly so, pilose. Femora black, apices yellow, tibiae and tarsi yellow.

♂.—Antennal joints slender; 2 short, subovate; 3 one-third longer, 4, 5, 6 subequal; 7-11 a little wider, twice as wide as 2, 3, 4. Fifth ventral segment with small concavity at the middle.

⁶ European references, of which there are many, have been largely omitted.

♀.—Antennal joints as in the male. Fifth ventral segment widely but not deeply concave transversely, otherwise simple.

Length 2.6–3.4 mm.; width 1.3–1.9 mm.

A European species quite distinct from any native form. It was introduced into this country and first recognized by the writer in 1893 at Chicago, Ill. It now inhabits the Eastern States from Massachusetts, New York and New Jersey to Wisconsin, Iowa and Nebraska and occurs also in Ontario and Quebec, Canada.

This species, known as the horse-radish flea-beetle, is an economic factor in the growing of horse-radish (*Radicula armoracia*) in our Northern States. The larvae as well as beetles live on the leaves and petioles and when numerous injure the plant so as materially to reduce the root crop. The larvae mine the petioles or midribs while the adults feed on the leaves, causing characteristic flea-beetle injury, withering and dying, or they gouge pits in the petioles or midribs. A general article on this species was published in 1917 (l. c.), to which the reader is referred for more detailed information in regard to its distribution and biology.

1a. *Phyllotreta armoraciae biplagiata* n. var.

A male specimen collected at Green Bay, Wis., May 29, 1915, by N. F. Howard, may be described as follows:

Of the same form as normal *armoraciae*, differing in having two narrow yellow elytral vittae. The subsutural one is subparallel in the anterior two-thirds and leaves a wider sutural black area. The humeri are black and behind them this vitta widens and unites with the lateral vitta for a short distance, then narrows and separates but unites with the subsutural vitta near the apex. The area between the vittae is black on one elytron but shows some tendency to unite the two vittae on the other.

Type ♂.—Cat. No. 28,792, U. S. National Museum. Unique.

The writer is inclined to the belief that *armoraciae* was originally bivittate, i. e., bore two pale vittae on each elytron.

2. *Phyllotreta lepidula* (Lec.)

Haltica lepidula Leconte, Pacific R. R. Rept., 1857, p. 68.

Orchestris lepidula Lec., Crotch, Proc. Acad. Nat. Sci. Phila., 1873, p. 65.

Phyllotreta lepidula Lec., Horn, Trans. Am. Ent. Soc., 1889, pp. 294, 295.

Oblong oval, moderately convex, shining black, surface with faint aeneous luster, each elytron with a narrow, simple, yellow vitta, nearly straight, incurved at apex. Antennae less than half as long as the body, shining black, joints 1-4 usually paler. Head rather coarsely and closely punctate. Prothorax not quite twice as wide at base as long, sides arcuately narrowing to the front, disc convex, coarsely and moderately closely punctate, surface faintly alutaceous. Elytra slightly wider at base than prothorax, surface more finely and sparsely punctate than prothorax, smoother at apex, the yellow vitta nearly exactly median, rather narrow, of equal width throughout, slightly incurved at apex. Ventral segments shining black with a faint aeneous luster, sparsely, finely punctate. Femora similar in color, tibiae paler at base, tarsi yellowish.

♂.—Antennal joints 2, 3, 4 subequal in length; 4 distinctly wider; 5 much wider, equal in length to 3 and 4 together; 6 very short, a little wider than long, deltoid; 7-11 gradually wider, 11 longer. Fifth ventral segment notched each side with impressed median line, sometimes extending the entire length of the segment.

♀.—Antennal joint 5 about as long as 3 and 4 together, not wider; 6 a little shorter than 2, otherwise as in male. Fifth ventral segment simple.

Length 2.0-2.5 mm.; width 1.0-1.2 mm.

Described from San Jose and San Diego, Calif. The writer has seen specimens from Los Angeles and Humboldt Co., Calif. The species does not appear to be recorded outside of California and is most commonly found in the southern part of that state.

3. *Phyllotreta oregonensis* (Crotch)

Orchestris oregonensis Crotch, Proc. Ac. Sci. Phila., 1873, p. 66.

Phyllotreta oregonensis Crotch, Horn, l. c., p. 296, pl. VI, fig. 16; Chittenden, l. c., p. 135.

Oblong oval, moderately robust, shining black, surface aeneous; prothorax dark green; elytral vitta broad, sinuous, somewhat incurved at base, strongly so at apex. Antennae nearly half as long as the body, black, two or three basal joints a little paler. Head rather closely, not coarsely punctate. Prothorax nearly twice as wide at base as long, narrowed in front, sides strongly arcuate; disc convex, punctures moderate and rather closely placed. Elytra a little wider at base than prothorax, humeri rounded, disc convex, punctation

a little coarser and closer than on the prothorax, without distinct serial arrangement, the vitta broad, as wide at middle as the distance to the suture, at base incurved, a broad, short, post-humeral branch, apical third strongly arcuate and incurved. Ventral surface piceous, abdomen sparsely punctate. Femora piceous, tibiae pale, brown at middle, tarsi pale.

♂.—Antennal joints 2, 3, 4 subequal; 4 short ovate, narrow; 3 distinctly wider, deltoid; 4 wider than 3; 5 wider than 4, as long as 3 and 4 combined and longer than 6 and 7 together, feebly convex on dorsal, convex on lower surface; 6 about as wide as long; 7-10 wider, subequal in length, 11 a little longer. Fifth ventral segment rather deeply concave each side, somewhat deeply, roundedly subdeltoidly concave at apex with a small distinct tubercle each side.

♀.—Antennal joint 4 equal to 3 in length and width; 5 not quite as long as 3 and 4 together and not wider; 6 as long as 4, wider at apex; remaining joints as in the male. Fifth ventral segment concave each side, but not concave at apex or middle.

Described from Oregon and stated by Horn to occur in Nevada. Specimens also from Rocky Ford, Fort Collins, Paonia, Fowler, Grand Junction and Montrose, Colo.; Laramie, Wyo.; Logan, Utah; "Utah"; Childress, Tex. (on turnip); Garden City, Hayes, Kans. (on turnip); Medicine Hat, Alberta, Canada (F. S. Carr).

Subject to very unusual variation in size and considerable variation in the width of the elytral vittae. Horn's definition of the male "antennae as in *vittata*" is incorrect, as will be noted from description above, the fourth and fifth joints in particular being widely dilated.

Reported in Colorado feeding on leaves, seed-heads and flowers of sugar beet, on foliage and flowers of peppergrass, *Lepidium (scopulorum) spathulatum*, and on *Cleome serrulatum*. The leaves of these weeds were extensively mined by the larvae, which were reared to adults July 8. Observed also feeding on radish, turnip and marsh-cress (*Radicula palustris* and *terrestris*).

4. *Phyllotreta robusta* Lec.

Phyllotreta robusta Leconte, Proc. Am. Phil. Soc., 1878, pp. 614, 615; Horn, l. c., p. 297, pl. VI, fig. 18.

Elongate oval, moderately convex, shining black, aeneous, elytra with a broad yellow vitta dilated at humerus and broadly at apex, reaching the sides and apex. Antennae as

long as half the body, black, three or four basal joints pale. Head alutaceous, somewhat indistinctly punctate. Prothorax nearly twice as wide as long, slightly narrowed in front; sides arcuate; disc convex, alutaceous, coarsely, deeply and closely punctate. Elytra scarcely wider at base than the prothorax, humeri obliquely rounded, surface rather more coarsely punctate at base than the prothorax, gradually more finely to apex, the yellow vitta broad, parallel with the suture the greater part of its length, incurved at the scutellum, a broad post-humeral process, the apical third broadly expanded, reaching the apex and side margin. Lower surface black, aeneous, ventral segments sparsely punctate. Femora black, tibiae and tarsi paler.

♂.—Antennal joints 2, 3, 4 subequal in length; 4 slightly wider, 5 as long as two preceding, apical free angle subacutely produced; 6 short and narrow, about as wide as long; 7-10 subequal; 11 longer. Fifth ventral segment sinuate each side, deeply impressed at middle, concavity thus formed extending nearly to the base of the segment.

♀.—Antennal joints about as in *oregonensis*. Fifth ventral segment slightly sinuate each side, otherwise simple.

Length 1.5-1.8 mm.; width 0.7-0.9 mm.

Originally described from Detroit, Mich., this species has been recorded from Lake County, Ind., and Garland, Colo. Specimens have been examined in the National Museum and other collections from Alamosa, Colo.; Lake Okoboji, Iowa (L. Buchanan); Marquette, Mich. (Hubbard and Schwarz); Medina (C. C. Sperry), University, N. D. (R. P. Currie); Salt Lake City (T. D. Urbans), Provo, Utah (Wickham); Elko, Nev. (Wickham); Assiniboine (Hubbard and Schwarz); Helena, Mont. (W. M. Mann); Jerome, Idaho (C. F. Stahl); Aweme, Onah, Teulon, Manitoba (N. Criddle); Ogema (N. Criddle), Saskatoon, Saskatchewan, Can. (K. M. King). The distribution probably ranges through intervening territory.

The beetles have been observed at Madison and Waupaca, Wis., on radish by L. G. Gentner, and at Knox, Ind., on turnip, June 27, 1911, by M. M. High.

Normal variation in this species is inconsiderable. A single female measures 2.2 mm. in length, otherwise the species is, with *liebecki* and *vittata*, one of the smallest of our vittate series.

5. *Phyllotreta zimmermanni* (Crotch) (Pl. I, Fig. 3)

Orchestrtris zimmermanni Crotch, Proc. Acad. Sci. Phila., 1873, p. 66.

Phyllotreta (Haltica) sinuata (nec Steph. et auct.) Horn,
Trans. Amer. Ent. Soc., vol. XVI, 1889, p. 295, pl. VI,
fig. 15.

Phyllotreta zimmermanni Cr., Riley, C. V., Rept. Comm.
Agr. f. 1884 (1885), pp. 305, 306; Heikertinger,
Verhandl. Zool. bot. Gesells. Wien., vol. LXI, 1911,
pp. 12, 13, 19, fig. 7; Chittenden, Proc. Ent. Soc.
Wash., v. 25, 1923, p. 132, 133.

Elongate oval, moderately robust, shining black, scarcely aeneous; each clytron with a narrow sinuous vitta, feebly incurved toward the suture at base. Antennae nearly half as long as the body, black, the three or four basal joints mostly paler. Head sparsely, finely punctulate. Prothorax nearly twice as wide at base as long, sides rather strongly arcuate and distinctly narrowed at apex; disc convex; surface very finely alutaceous, punctures distinct, not coarse, more widely placed than their own diameters. Elytra scarcely wider than the prothorax, humeri obliquely rounded, disc convex, punctures coarser and closer than those of the thorax, finer near the apex, with strong tendency to serial or linear arrangement on the disc; vitta narrow, subparallel with the suture in basal half, very feebly incurved at base, with a short, broad, post-humeral branch, apical third strongly sinuous, recurving toward but not quite reaching the suture. Ventral surface black, abdomen sparsely punctate. Femora piceous, tibiae and tarsi partly brown.

♂.—Antennal joints 2, 3, 4 subequal in length; 3 wide, deltoid; 4 one-third wider than 3, much widened at apex; 5 as long as 3 and 4 combined, and much wider, irregularly oblong oval, distinctly convex on upper, concave on lower surface; 6 very small, nodiform; 7–11 subequal in length and wider. Fifth ventral segment deeply concave each side and in middle, the latter concavity deltoid with a median impressed line extending the entire length of the segment.

♀.—Antennal joint 5 nearly as long as the preceding or following two, but not wider. Fifth ventral segment usually simple, sometimes faintly to distinctly impressed at the sides.

Length 1.8–2.4 mm.; width 0.9–1.2 mm.

This species is distinct from *sinuata* Steph., which does not occur in America. The distribution extends from New England to Mississippi and westward to Manitoba. Specimens examined from Mashpee, Mass.; Norwalk, Conn.; Bloomington, Ill.; St. Louis and Charleston, Mo.; Knox, Independence, Ind.; Rosslyn, Arlington,

Va.; Washington, D. C.; Berwyn, Md.; Chadbourn, Biltmore, N. C.; Natchez, Miss.; Omaha, Nebr.; Iowa City, Ia.; Baldwin, Lawrence, Topeka, Kans.; Elkins, Ark.; Madison, Green Bay, Wis.; Florence, Mont.; St. Anne, Quebec, Canada; Bandon, Aweme, Miami, Rosebank, Winnipeg, Thornhill, Manitoba.

In the male the fifth antennal joint is distinctly bowed. The impressed line in the male ventral concavity is sometimes shorter than described.

Two examples, from Iowa, of what appear to be otherwise normal *zimmermanni*, differ in such a remarkable manner as to appear deserving of notice. The antennae are as in the female, the fifth ventral segment is distinctly concavely impressed at the sides, as in the male, and the apex distinctly, but not deeply impressed at the middle, the impression extending nearly half the length of the segment. Two females of *zimmermanni* from the District of Columbia show impressions on the fifth ventral segments at the sides only.

Ph. zimmermanni, called "Zimmermann's flea-beetle," occurs in numbers on *Lepidium* and *Arabis*, the larva mining the leaves. In 1913 and 1914 the larva was observed mining the leaves of cultivated cress and the beetles feeding on the foliage of cress, radish, turnip and cabbage at Quebec, Canada; the cress was practically destroyed by the beetle and its larva. In May, 1919, the species was reported on cabbage, radish and horse-radish at Madison, Wis. In June, 1920, this species, in company with *Ph. vittata*, destroyed an entire planting of mustard at Arlington, Va., eating the plants to the ground.

A biological account of this species was published by Riley in 1885 (l. c.), including a description of the egg, larva, pupa, and of the adult in comparison with *vittata*. Of the larvae Riley remarked that although the two species are quite similar, they "differ widely in habit," and at first sight it might appear quite a step from a leaf-miner to a root-feeder. That such is not the case has been conclusively proved by experiment. A larva, being reared in a vial and having exhausted the leaves, bored through a stalk and finally formed a mine under the skin on one side, living quite as well in this manner as otherwise. It would be an easy transition for a leaf-mining larva of this genus to follow down a stem to the roots in such low-growing plants as *Lepidium*.

6. *Phyllotreta utana* Chtttn. (Pl. II, Fig. 6)

Phyllotreta utana Chittenden, Jour. Wash. Ac. Sci., v.
10, 1920, pp. 389, 390, fig. 1.

Elongate oval, moderately convex, shining black with more or less distinct metallic luster; prothorax and elytra variably black or aeneous; elytral vittae narrow, feebly sinuous, pale yellowish. Antennae less than half as long as the body, joints 2 to 5 usually honey yellow, 1 and 6 either partly black or pale, remainder piceous. Head finely, densely punctate. Prothorax about one-third wider than long, wider than the head at the apex, sides strongly irregularly arcuate; surface distinctly, rather closely punctate. Elytra wider at base than prothorax, humeri abruptly, narrowly rounded, umbone moderate, sides somewhat feebly arcuate. Vittae narrow, rather feebly recurved toward suture at base, subparallel in middle third, about half as wide in apical fourth, incurved toward, but not reaching the suture, humeral branch distinct and broad, no apical branch; surface scarcely more coarsely punctate than on the thorax with the exception of the base and without tendency to serial arrangement. Ventral segments subopaque black, rather feebly and sparsely punctate, sparsely pilose with short black hairs. Femora piceous, punctulate; tibiae and tarsi yellowish brown.

♂.—Antennal joints 2, 3, 4 subequal in length; 3 wider at apex; 4 much wider, deltoid; 5 still wider, about one-half longer than 4, depressed, inner face longer, straight, outer surface arcuate; 6 nodular; 7–11 a little wider than 3, 11 a little longer. Fifth ventral segment concave at the sides, distinctly concave at the apex with a distinct tubercle each side and a fine median impressed line about the length of the segment.

♀.—Antennae about as in *zimmermanni* and *vittata*. Last ventral segment simple.

Length 2.5–3.0 mm.; width 1.4–1.5 mm.

Logan, Utah (type locality); also Alta, Park City, Utah; Elko, Nev.; Corvallis, Forest Grove, Oreg.; Florence, Mont.

In general appearance and punctation this species is similar to *zimmermanni*. In addition to the distinctive characters of the antennae, joints 2–5 honey yellow and 5 flat, not bowed, and the last ventral segment of the male, the elytral vittae are quite different from other species, approaching *zimmermanni*, but are not so distinctly sinuate or so distinctly yellow as in that species. It is larger than the latter, which measures only 1.8–2.4 mm.

Has been observed attacking sugar beet and was abundant in a beet field overgrown with hedge mustard, on which it was also taken.

7. *Phyllotreta vittata* (Fab.) (Pl. I, Fig. 1)

Crioceris vittata Fabricius, Syst. Eleuth., v. I, 1801, p. 469.

Haltica striolata Fabricius, in Illiger, Mag. f. Insekten-Kunde, v. VI, 1807, p. 148.

Orchestris vittata Fabricius, Crotch, Proc. Ac. Sci. Phil., 1873, p. 66.

Phyllotreta sinuata Redtb. et auct. (cf. Heikertinger).

Phyllotreta vittata Fabricius, Horn, Trans. Am. Ent. Soc., 1889, p. 296; Heikertinger, Die Käfer des deutschen Reiches, v. 16, 1913, p. 174, 175, fig. 20; Chittenden, l. c., p. 133, fig. 1.

Elongate oval, moderately convex, shining black, surface with slight aeneous luster, elytra with a yellow vitta incurved at base, thickened and slightly incurved at apex. Antennae half as long as the body, piceous, the basal two or three joints testaceous. Head sparsely, finely punctate with a frontal longitudinal impressed line. Prothorax about one-third wider than long, narrowed in front, sides moderately arcuate, convex; surface minutely alutaceous, punctures moderately coarse and close, denser at the sides. Elytra a little wider at base than the prothorax with humeri obliquely rounded, convex, punctures scarcely coarser than those of the prothorax, moderately closely placed, finer near the apex and with a strong tendency to a serial arrangement in the yellow vitta. Vitta usually strongly constricted at middle, incurved at base and with a broad, short, post-humeral branch, apical third abruptly broader, incurved apically toward, but not attaining the suture, on the apex. Ventral segments subopaque black, faintly alutaceous, punctures numerous, but not coarse. Legs piceous, tibiae and tarsi brown.

♂.—Antennal joints 2, 3, 4 subequal in length; 4 wider, 5 a little wider than 4, nearly equal in length to 3 and 4 together or 6 and 7 combined; 6 short; 7–10 subequal; 11 longer. Fifth ventral segment concave at apex, concavity small, moderately deep and more or less circular in outline.

♀.—Antennal joints 2, 3, 4 and 7–11 as in male; 5 scarcely shorter but narrower than in male. Fifth ventral segment simple, but in some specimens there is a faint impression at the apex.

Length 1.6–1.8 mm.; width 0.8–0.9 mm.

This species, the well-known striped cabbage flea-beetle, also inhabits Europe and northern Asia and evidently is an introduction

from the Old World. In America it occurs from New England westward to Wisconsin, Kansas, and neighboring western States, southward to the Gulf States, as also in California. It occurs commonly in southern Canada, also in Nova Scotia, Manitoba and British Columbia. So far as known, it has not yet reached the strip of States from Montana to New Mexico.

The food plants known to the writer include cabbage, cauliflower, turnip, radish, mustard (*Brassica nigra* and *arvensis*), horseradish, watercress, peppergrass (*Lepidium*), charlock (*Sinapis*), shepherd's purse (*Bursa*), stock (*Matthiola incana* et al.), Virginia stock (*Cakile maritima*), rocket (*Hesperis matronalis*), hoary alyssum (*Berteroa incana*), sweet alyssum (*Alyssum maritimum* et al.), wallflower (*Chieranthus cheiri*), candytuft (*Iberis*), yellow cress (*Radicula silvestris*), sea lavender (*Statice sinuata*), *Erysimum* spp., and the beetle probably attacks all other Cruciferae and Capparidaceae. The larva is restricted to these two families, but the beetles when in unusual numbers have been reported to attack plants of other botanical families, such as peas, beets, celery, tomato, and strawberry. Reports of injury to such plants are apt to be erroneous, the insect in reality living on cruciferous weeds growing in truck patches between rows.

In 1885 Riley⁷ gave an account of *vittata* and its habits as known at that time with special reference to injuries to cabbage and turnips, the account including a detailed description of the larva.

Five color varieties or forms exist, two of which have been described.

7a. *Phyllotreta vittata monticola* Weise

Phyllotreta vittata monticola Weise, Naturg. Ins. Deutsch., pt. I, vol. 6, 1893, pp. 873, 874.

Elytra each with the yellow vitta covering a great part of the elytron, leaving a small marginal border scarcely or very feebly constricted at the middle and evenly arcuate in outline.

Length 1.8 mm.; width 0.9 mm.

Specimens from Marburg, Styria, Austria, have been received from Franz Heikertinger, which are typical. In a lot of hundreds of specimens examined it is represented from Huntington Beach, Calif.; Edmonton, Alberta, Canada, and the District of Columbia. This variant is comparatively rare on this Continent.

⁷ Rept. Comm. Agr. 1884 (1885), pp. 301-304.

7b. *Phyllotreta vittata discedens* Weise (Pl. I, fig. 2)

Phyllotreta vittata discedens Weise, l. c., pp. 873, 874.

Elytra each with two large irregular, wide yellow spots; humero-basal spot not extending to lateral margin or reaching the base, incurving basally toward the elytral suture; subapical spot narrower, widely subreniform, incurved apically toward the suture.

Length 2.0 mm.; width 0.8 mm.

This variant occurs more commonly in the South, in the Gulf States practically taking the place of normal *vittata*. Numerous specimens from San Antonio, Cuero, Tex.; Baton Rouge, La.; Crystal Springs, Miss., and Orlando, Fla.; occasionally seen from St. Louis, Mo. Once taken at Plummer's Island, Md., about five miles from the District of Columbia, by W. L. McAtee.

It is smaller than *bipustulata*, with which it has been generally confused and which it closely resembles in coloration and punctuation, distinctly differing in the antennal structure of the male and the incurved subapical vitta. There is a tendency in this species to lighter coloration in the paler portions. One fully developed specimen has the first four antennal joints, tibiae and tarsi pale yellow.

7c. *Phyllotreta vittata lineolata* n. var.

Elytra each with a very narrow incurved dark red or bright yellow subhumeral spot, and a longer and narrow incurved subapical spot, the latter either widely separated from the humeral one or exceptionally connected by a faint red or yellow line.

Length 1.8 mm.; width 0.9 mm.

Corvallis, Oreg., July 2, 1918; Ft. Collins, Colo.; Washington; Waupaca, Wis.; Knox, Ind.; Ithaca, N. Y.; Birmingham, Ala.; Muscatine, Iowa; Rampart, Alaska.

Type ♂.—Cat. No. 28,805, U. S. National Museum.

The type of this variant, although related to *vittata discedens*, resembles also *decipiens ordinata*, which latter has either one or two spots on each elytron.

7d. *Phyllotreta vittata vernicosa* n. var.

Surface brightly shining black. Antennae scarcely half as long as the body, first and second joints reddish, remainder piceous. Prothorax very large and wide with two depressions each side; surface not deeply punctate. Elytra so highly

glittering like varnish as to partially obscure the punctation, which is not at all serial in character. Femora pale at apex, tibiae yellow at each end, tarsi dark brown.

♀.—Antennal joint 5 not wider than adjacent joints, or about as in the female of typical *vittata*. Fifth ventral segment distinctly longitudinally impressed for more than half its length, not circular in outline.

Length 2.5 mm.; width 1.2 mm.

Fieldbrook, Calif., May 30 (H. S. Barber).

Type ♀.—Cat. No. 28,809, U. S. National Museum. One specimen.

The type is much larger than normal. The antennal structure indicates that it is a female, but the median impression of the fifth ventral segment is masculine. A similar case is cited in the discussion of *zimmermanni*.

7e. *Phyllotreta vittata artivitta* n. var.

Shorter and more robust than normal *vittata*, brightly shining black without color luster. Antennal joints 1, 2, 3 piceous, remainder black, otherwise about as in *vittata*. Prothorax strongly convex, highly polished. Elytral vittae deep ochreous, incurved at base, but not reaching basal margin, without definite branch; remainder extending in a nearly straight and narrower line, not attaining the apex. Surface of elytra without distinct tendency to serial arrangement of punctures. Legs black.

Length 1.5 mm.; width 0.9 mm.

Muscatine, Iowa (F. M. Wadley).

Type ♂.—No. 28,803, U. S. National Museum. One male.

The vittae are quite unlike those of normal *vittata*, more nearly resembling *zimmermanni*, but the antennae are practically the same. This aberration is described from a somewhat imperfect, poorly mounted male.

The study of the five variations of this common species interests the writer and probably many others, and it is furthermore believed that all data that have a bearing on the taxonomy of a genus or other group should be recorded. Such study may also have a bearing on the status of species or so-called species in related groups. Form *monticola* may intergrade slowly with normal *vittata*, but specimens have not been seen which confirm this supposition. Form *discedens* intergrades frequently, especially in the Gulf region, both forms being found in the same localities, and the same is true of *lineolata*

in more northern regions. Forms *vernica* and *artivitta* are unique; hence nothing more can be said of them further than to state that well-marked individuals of each variant present the aspect of new species.

The width of the antennal joints, especially of 4 and 5, is quite variable in *vittata*.

8. *Phyllotreta liebecki* Schf. (Pl. I, fig. 4)

Phyllotreta liebecki Schaeffer, Jour. N. Y. Ent. Soc., vol. XXVII, 1919, p. 439.

Similar in form and color to *vittata*, surface smoother, more shining and aeneous; elytra each with a moderately broad yellow vitta widely placed, extending to the extreme base, incurved at scutellum, dilated below humerus, moderately constricted near middle, strongly dilated near apex, apical part incurved to the suture. Antennae scarcely half as long as the body, moderately slender, joints 1-4 yellow. Head alutaceous, distinctly punctate. Prothorax about twice wider than long, sides arcuate, slightly narrowed in front; surface alutaceous, punctures moderately coarse and close. Elytra slightly wider at base than the prothorax, humeri obliquely rounded; surface moderately coarsely punctate, punctures much finer towards apex. Ventral surface piceous, abdominal segments rather sparsely punctate. Femora black with a feeble metallic lustre, yellow at apex, tibiae and tarsi yellow.

♂.—Antennal joints 2 and 3 subequal; 4 distinctly shorter than the preceding; 5 a little stouter than in *vittata*; 6 short, oval; 7-10 subequal and less elongate than in *vittata*, 11 slightly longer than the preceding. Last ventral segment impressed at sides, with a small moderately transverse impression at apex.

♀.—Third and fourth antennal joints nearly equal; fifth longer than either the fourth or sixth, the latter elongate but shorter and more slender than the seventh, seventh to tenth equal, eleventh a little longer.

Length 1.75 mm.; width 0.85 mm.

Enterprise, Florida (type); also seen by the writer from Jacksonville, Fla.; Baton Rouge, Hammond, Ponchatoula, La.; Columbus, Tex., and Plummer's Island, Md., five miles north of the District of Columbia (W. L. McAtee).

This species is distinguishable from *vittata*, which it resembles in outline and in punctation, by the male antennae, particularly the

much shorter fourth and wider fifth joint, by the elytral vitta incurving to the suture, as also by the paler legs and more metallic surface.

At Baton Rouge, La., on mustard, radish and Chinese cabbage or pe-tsai, the larva reared from mines in the leaves of *Lepidium virginicum*, *Radicula walteri* and *obtusa* and *Arabis virginica*.

9. *Phyllotreta alberta* n. sp.

Elongate oval, slightly more than twice as long as wide, moderately convex, shining black on dorsal surface; elytral vittae ocher yellow, sinuous, nearly uniformly wide, with wide humeral and postapical branches. Antennae half as long as the body, black. Head irregularly, somewhat finely sparsely punctate, with a distinct frontal impression. Prothorax nearly twice as wide as long, moderately convex, moderately shining, with aeneous luster, somewhat strongly and sparsely punctate. Elytra elongate oval, much wider at base than prothorax, rather feebly arcuate at sides; surface strongly, rather densely punctate, with no tendency to stria arrangement on the disc, but a distinct tendency at the sides on the vittae. Each yellow vitta (without the branches) of nearly uniform width throughout, distinctly sinuous, moderately incurving toward suture at base, forming a long humeral branch, enclosing the humerus, strongly constricted at the middle toward the suture, followed by a distinct subapical branch, recurved toward apex, nearly attaining the suture. Ventral surface feebly, sparsely punctate. Tibiae and tarsi a little paler than femora.

♂.—Antennal joint 1 very thick; 2, 3, 4 short, slender, subequal; 5 as long as 3 and 4 together but shorter than 6 and 7 combined; 7 equal to 4 in length, deltoid; 7-11 nearly twice as wide as 4; 11 a little longer. Fifth ventral segment deeply transversely concave at sides, vaguely if at all impressed at extreme apex.

♀.—Antennal joints nearly as in the male. Fifth ventral segment not concave or impressed at sides or at apex.

Length 2.3-2.4 mm.; width 1.0-1.1 mm.

Edmonton, Alberta, Canada (F. S. Carr), May 1, 1918.

Collected by Mr. Carr on *Lepidium virginicum*.

Type ♂.—Cat. No. 28,791, U. S. National Museum. Paratypes in the Canadian National collection and that of F. S. Carr.

No variation worthy of mention rather than sexual is observable in the material examined. The resemblance of the females to *zimmermanni* is strong. The elytral vittae of *alberta* are wider

and more abruptly constricted near the middle toward the suture than in *zimmermanni*, though not so strongly as is usual in *vittata*, and the humeral and apical branches are wider than in *zimmermanni*. The appendages are nearly black throughout, and the ventral surface is not so distinctly punctate.

10. *Phyllotreta perspicua* n. sp.

Elongate oval, twice as long as wide, moderately convex, black, elytral vitta buff yellow, very narrow, sinuous, with narrow humeral and apical branches. Antennae half as long as the body, five basal joints dull reddish yellow, first black above, apical joints black. Head nearly uniformly and densely, distinctly, but finely punctate. Prothorax nearly twice as wide as long, convex, distinctly wider at apex than the head; surface finely, distinctly and densely punctate, slightly aeneous and moderately shining. Elytra wider at base than prothorax, convex, strongly arcuate at sides; disc a little more coarsely and sparsely punctate, punctures less distinct at sides, nearly as strong at apex, with some tendency to serial arrangement. Vittae each proceeding from base, where it is incurved somewhat feebly toward the suture, humeral branch very short, extending distally from the prominent humerus a little farther than the length of the humerus, apical branch beginning about one-fifth from the apex, the vitta extending nearly to the apex but still nearer to the suture. Ventral segments distinctly, finely and densely punctate, feebly pilose at the sides with gray hairs, distinctly at the apex with fine black hairs. Posterior femora nearly smooth, black, brown at apex; tibiae and tarsi mostly reddish brown.

♂.—Antennae as in *alberta*. Fifth ventral segment scarcely impressed at sides, concave in apical half, with distinct but not deeply impressed median line half the same length of the segment and widely concave at the extreme apex.

♀.—Has not been seen.

Length 2.6 mm.; width 1.3 mm.

Klamath Lake, Oreg., 1917 (Dr. Conger, coll. Ralph Hopping).

Type ♂.—Cat. No. 28,812, U. S. National Museum. Unique.

The male has the antennae and general appearance of a female *utana*. Of the unusual fifth ventral in the male it may be added that it is subdeltoid, about one-half wider than long at the base and obtusely rounded at the apex; the surface is densely, distinctly, and finely punctate throughout and the apex is so densely pilose

as to appear pubescent beyond the segment. The distinguishing features include the distinct and dense punctation of the head, prothorax and ventral segments, the finely distinctly punctate surface of the prothorax and the widely concave apex of the fifth ventral segment of the male.

11. *Phyllotreta obtusa* n. sp.

Oblong oval, robust, distinctly less than twice as long as wide, somewhat strongly convex, subopaque black; elytra each with a dull ochereous, very narrow sinuous vitta. Antennae moderately thick, a little more than half as long as the body, black, second and third joints dark brown. Head wide, surface irregular, finely punctulate. Eyes not prominent, widely separated. Prothorax large, less than twice as wide as long at base, strongly, regularly arcuate at sides, much wider at apex than head; surface somewhat uneven, sparsely subacutely punctate. Elytra comparatively short, at base much wider than prothorax, basal three-fifths subparallel at sides, apical two-fifths suddenly but rather feebly arcuate, humeri rounded, umbone small; vitta very narrow, attaining the base where it is incurved toward the suture, and with a short humeral branch, only apical third outcurved, then incurved and narrowed, not reaching the suture; surface a little more coarsely punctate on the disc, finer at sides and apex, with moderate tendency to serial arrangement. Ventral segments shining black, very feebly punctulate. Femora black, tibiae brown, tarsi pale yellowish brown.

♂.—Antennal joints 2 and 3 subequal in length and width; 4 not wider, shorter than 2 and 3 combined; 5 slightly wider at apex than 4, fully as long as 2 and 3 together; 6 as long as 4; 7–11 wider. Fifth ventral segment strongly concave each side, apex obconical.

♀.—Unknown.

Length 1.6 mm.; width 1.0 mm.

Breckenridge, Colo., July 15, 1896, elevation 9,000–10,000 feet (H. F. Wickham).

Type ♂.—Cat. No. 28,793, U. S. National Museum. One specimen.

This species differs from any other with vittate elytra by its shorter and more robust form. The vittae resemble somewhat those of *zimmermanni* but they are distinctly incurved at the base and do not even approach the suture at the apex; they are narrower and darker in color. The head is without a depressed median line and

on the prothorax there is tendency to a transverse depression near the base.

12. *Phyllotreta oblonga* n. sp. (Pl. II, fig. 5)

Moderately elongate oval, twice as long as wide, moderately convex; highly polished black on dorsum, shining black on ventral surface; elytral vittae ocher yellow, wide at the ends. Head irregularly, coarsely and sparsely punctate. Antennae distinctly less than half as long as the entire body; first three joints pale reddish. Prothorax about one-half wider than long, strongly convex, very highly polished, without aeneous luster; surface finely, feebly and sparsely punctate. Elytra rather short oval, strongly arcuate at the sides, feebly and sparsely punctate, without distinct tendency to serial arrangement. Each yellow vitta on margin toward suture extending from base toward apex in a nearly straight line, leaving between them a parallel-sided or oblong median area more than 3 times as long as wide; anterior lateral branch with its lateral margin parallel with the corresponding margin of the prominent humerus; at middle strongly arcuately narrowed but comparatively wide; posterior branch a little wider than anterior, slightly recurving at the extreme apex toward the suture. Ventral surface densely punctate. Tibiae and tarsi pale yellowish brown.

♂.—Antennal joints 2, 3, 4, 6 subequal, 5 a very little longer, 2-6 only a little narrower at the base than at the apex, 7-10 less than twice as wide, elongate deltoid, 11 a little longer. Fifth ventral segment somewhat feebly concave at sides, otherwise simple.

♀.—Antennae as in male. Fifth ventral segment simple. Length 2.4 mm.; width 1.2 mm.

Edmonton, Alberta, Canada (F. S. Carr), June 1, 1919, on *Lepidium virginicum*.

Type ♂.—Cat. No. 28,840, U. S. National Museum. Paratype in the collection of Mr. Carr.

In some specimens only the first two antennal joints are paler than the remainder, and in some the extreme base of the elytral vitta shows a slight tendency to curve toward the suture.

This species appears to have no counterpart in our fauna, the nearly straight subsutural line of the elytral vitta distinguishing it from all other species. In others having elytral vittae strongly sinuous on the lateral margin, the base of each vitta is more or less distinctly incurved toward the suture. A similar straight inner line is present in certain European vittate species, notably *vittula*

Redtb., *nemorum* L. and *undulata* Kutsch., the last doubtfully established in the United States. Even with the rather small series available for study, one specimen indicates a tendency to the extreme color variations displayed by *vittata*. This shows only a thin subsutural line connecting the anterior and the posterior branches of the elytral vitta. The size of this species is about one-fourth longer than *vittata* and the width is considerably greater. The male sexual characters, strongly arcuate sides of the elytra and the still stronger recurvature of the lateral margin of the elytral vittae at the middle and the finer and lighter punctation are also noticeable characteristics.

13. *Phyllotreta ramosa* (Crotch) (Fig. 2)

Orchestris ramosa Crotch, Trans. Am. Ent. Soc., 1874, p. 80.

Phyllotreta ramosa Crotch, Horn, Trans. Am. Ent. Soc., 1889, p. 299; Essig, Ins. Cal., 1915, p. 282, fig. 275, 276; Insects of Western North America, 1926, p. 480, 481.

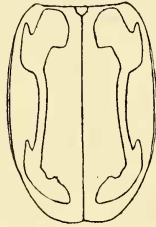


Fig. 2.—*Phyllotreta ramosa* in outline, highly magnified.

Elongate oval, more than twice as long as wide, moderately convex, black, with very faint aeneous luster, each elytron with a narrow sinuous yellow-white vitta with a humeral and lateral branch. Antennae scarcely half as long as the body, piceous, second and third joints and underside of first pale. Head with very few punctures between the eyes. Prothorax one-half wider than long, narrower in front, sides arcuate, disc convex, punctures moderately coarse and rather closely placed. Elytra a little wider at base than the prothorax, humeri rounded, disc convex, punctures coarser than those of the thorax, but not so closely placed; each elytron with a slender sinuous vitta, incurved at base and with a post-humeral branch; near the apex the vitta joins a narrow crescentic spot, one end of which points

anteriorly, the other is incurved toward the suture, forming an apical branch. Ventral segments shining black, punctulate. Posterior femora black, distinctly but feebly punctulate; tibiae and tarsi largely piceous or rufopiceous.

Length 1.8–2.1 mm.; width 0.7–0.9 mm.

♂.—Antennae as in *bipustulata*. Last ventral very feebly sinuate on each side, a short, rather feeble impression at apex.

♀.—Antennae as in the male. Fifth ventral segment flat and simple.

Lakeport, Calif. (type locality); Los Angeles, Chino, Guadeloupe, Crystal Springs, Alameda, San Jose, San Mateo, Los Amigos, Guerville, Gilroy, Davis, Calif.; Elko, Nev. (Wickham); Rochester, N. Y. (Dr. D. E. Fink).

This species resembles *vittata* in color and punctation, but may be recognized by the form of the apical portion of the vitta and the undilated fifth joint of the male antenna, which will distinguish it from that species.

Essig (l. c., p. 480) reports this flea-beetle often very abundant and destructive to cabbage, cauliflower, Brussels sprouts, radish, rape, mustard, stocks, turnip, wallflower, watercress and other cruciferous plants in California.

14. *Phyllotreta bipustulata* (Fab.) (Pl. II, fig. 7)

Crioceris bipustulata Fabricius, Syst. El., vol. I, 1801, p. 464.

Orchestris bipustulata Fab., Crotch, Proc. Acad. Nat. Sci., Phila., 1873, p. 66.

Phyllotreta bipustulata Fab., Horn, l. c., p. 300; Chittenden, Bul. 33, n. s., Div. Ent., U. S. Department of Agriculture, 1902, pp. 77, 78, fig. 18; Proc. Ent. Soc. Wash., vol. 25, 1923, pp. 133, 134.

Oblong oval, moderately robust, black, shining without metallic luster; each elytron with two large, irregularly oval, yellow spots, one humeral, the other subapical. Antennae half as long as the body, distinctly thicker externally, black, the five basal joints paler. Head sparsely, finely punctate, not alutaceous. Prothorax one-third wider than long, narrowed apically, sides feebly arcuate, disc convex, punctures aciculate, not closely placed, surface very indistinctly alutaceous. Elytra distinctly wider at base than the prothorax, humeri obtusely rounded, punctures coarser than those of the thorax, but gradually finer toward the apex, and with a

faint tendency to a serial arrangement at middle, humeral spot oval, touching the base, not including the umbone, subapical spot elongate oval, narrower, not incurving toward the suture. Ventral segments black, sparsely punctate. Posterior femora darker beneath, tibiae and tarsi rufo-testaceous.

♂.—Antennae with fifth joint very slightly longer than 4 or 6, but not wider. Fifth ventral segment sinuate at sides, deeply concave at middle, concavity circular in outline.

♀.—Antennae with fifth joint scarcely shorter than in male. Fifth ventral feebly impressed at apex.

Length 1.6–2.1 mm.; width 0.8–1.1 mm.

Exact localities have been indicated by the writer (l. c., 1902) in the States of New York, New Jersey, Maryland, Virginia, Indiana, Iowa, Illinois and Wisconsin. Specimens also have been seen from Grand Ledge, Highland Park, Mich.; Marietta, Ohio; Berkeley Springs, W. Va.; Heyworth, Ill.; St. Louis, Mo., and Baxter Springs, Riley and Douglass Counties, Kans.

This species does occasional damage to cabbage, mustard, radish, turnip and horse-radish and occurs commonly on these plants. It also attacks wild Cruciferae, such as *Lepidium virginicum*, *Barbarea barbarea*, *Radicula palustris*, *Sysimbrium officinale* and *Bursa bursapastoris*. The larva is with little doubt a root-feeder.

14a. *Phyllotreta bipustulata conjuncta* Gentn.

Phyllotreta conjuncta Gentner, L. G., Entom. News, vol. XXXV, 1924, p. 168.

A male of this form from Riley Co., Kans., collected by F. Marlatt, and another from a lot of *Phyllotreta* collected by Mr. Gentner before he had specialized on the *Halticini* have been studied. The latter is labeled Madison, Wis., May 29, 1919, on radish. The type is from East Lansing, Mich. In the Wisconsin and Kansas specimens the two dark yellow elytral vittae are nearly separated at the middle by an extremely thin darker area. Gentner's surmise that this form "may at some time be shown to bear closer than specific relation to" *bipustulata* meets with the writer's agreement. The material now available, together with intergradational forms, in the writer's opinion, establishes positively the zoological status of this form as a variant. Thus far this variant has not been seen among Eastern material. It occupies much the same relationship toward normal *bipustulata* as *discedens* toward *vittata*.

The fifth abdominal segment in the male terminates in a subtriangular concavity, deeply impressed at the middle, the impression extending to the base of the segment.

15. *Phyllotreta denticornis* Horn

Phyllotreta denticornis Horn, Trans. Am. Ent. Soc., 1889, pp. 297, 298, Pl. VI, fig. 19.

Elongate oval, rather feebly convex, black, shining, surface with very slight aeneous luster. Antennae half as long as the body, black, second and third and a portion of the fourth joints paler. Head alutaceous, rather closely punctate. Prothorax nearly twice as wide as long, slightly narrowed in front, sides somewhat feebly arcuate, disc convex, alutaceous, moderately coarsely and closely punctate. Elytra distinctly wider at base than the prothorax, humeri rounded, umbone prominent, surface shining, not alutaceous, the punctures finer than on the prothorax, equally dense, but less impressed, smoother near the apex. Ventral segments sparsely punctulate, clothed with gray pile. Femora piceous, tibiae and tarsi brownish.

♂.—Antennal joints 2, 3 subequal in length; 2 nearly twice as long as wide, very narrow; 3 triangular, much wider than 2; 4 still wider, also longer, subdeltoid, with its inner angle produced in a subacute process; 5 longer and a little wider than 4, of elongate oval form, bowed; 6 very short, with its lower angle produced into an acute process; joints 7–10 subequal in length and width, serrate on inner surface; 11 longer. Fifth ventral segment feebly sinuate each side, strongly concave at middle.

♀.—Antennal joints shorter, 2, 3, 4 subequal; 5 fully one-half longer than preceding; 6 of same length as 2, a little wider; 7–11 slightly wider. Fifth ventral segment strongly concave each side, otherwise simple.

Length 2.4–2.6 mm.; length 1.3 mm.

Described from the male "California; region unknown." The female was also hitherto unknown. Represented by a good series from Hood River and Dalles, Oregon (Hubbard and Schwarz).

Of this species Horn remarked that while "it has the dilated antennal joints of the vittate species, the form of body and uniform color approach it to *albionica*." The females are, indeed, much alike in the two species. In the male the antennal joints are noticeably longer.

16. *Phyllotreta amplicornis* n. sp.

Elliptical oval, nearly three times as long as wide, moderately convex, shining black without metallic or other luster. Antennae barely half as long as the body, entirely black, all except second joint very thick. Head wide with distinct

minute interocular fovea, feebly sparsely punctulate. Eyes of moderate size, rather widely separated, not prominent. Prothorax about one-third wider than long, moderately convex, sides moderately arcuate, at apex wider than the eyes, narrowed at base; surface rather coarsely densely punctate. Elytra suboblong, distinctly wider at apex than prothorax, humeri very broadly rounded, umbone prominent, somewhat sharply defined, sides subparallel; surface rather uneven, disc a little more coarsely and densely punctate, more feebly at sides, with a slightly elevated nearly smooth longitudinal line midway between the umbone and the suture. Ventral segments shining black, tibiae and tarsi piceous.

♂.—Antennal joint 2 one-third longer than wide; 3 much wider, triangular; 4 still wider, subquadrate; 5 slightly wider than 4, suboval; 6 suboblong, narrower than 4; remaining joints about as wide as 6. Fifth ventral segment feebly punctulate, sinuate at sides and with a large deep oval concavity at apex.

♀.—Not seen.

Length 2.2 mm.; width 0.8 mm.

Type ♂.—Cat. No. 28,802, U. S. National Museum. One specimen.

This species has more strongly developed male antennal joints than in any other concolorous species in our fauna, except *denticornis*, to which it is closely related. It is, moreover, more slender and more oblong in form and the color, especially of the antennae, is nearly uniform shining black throughout.

17. *Phyllotreta ulkei* Horn

Phyllotreta ulkei Horn, Trans. Am. Ent. Soc., 1889, p. 298.

Oblong oval, moderately convex, piceous black, shining, without metallic luster; legs, excepting the posterior femora, reddish brown. Antennae half as long as the body, piceous, three basal joints pale. Head not punctate. Thorax one-third wider than long, very little narrowed in front, sides arcuate, disc convex, sparsely regularly punctate, surface alutaceous. Elytra scarcely wider than the thorax, humeri obliquely rounded, a distinct depression within the umbone, disc convex, more coarsely, closely and deeply punctate than the thorax, a little smoother near the apex, surface shining. Body beneath piceous, abdomen sparsely punctate. Legs reddish brown, posterior femora piceous. Length 0.10 inch; 2.5 mm.

♂.—Last ventral segment distinctly sinuate each side, middle lobe moderately prominent, a deep triangularly oval

impression extending more than half the length of the segment. Antennae with joints 2, 3, 4 gradually shorter and broader, fifth as long as the preceding two and more than twice as broad, sixth equal to fourth, 7-10 longer and equal, eleventh longer (Horn).

Ohio.

In commenting on this species, Horn states that it is rather more robust than any other known to him, recalling some *Chaetocnema*. Among species without elytral vittae, the male is distinguished by the broad fifth antennal joint and the simple form of the sixth, as long as the fourth.

18. *Phyllotreta decipiens* Horn

Phyllotreta decipiens Horn, l. c., p. 298.

Oval, rather strongly convex, shining black without metallic luster; elytra without an apical red spot. Antennae fully half as long as the body, first three joints black, although sometimes paler. Head obsoletely finely punctulate. Prothorax short, one-half wider than long, slightly narrowed anteriorly, scarcely wider than the head, feebly arcuate at the sides; disc convex, deeply, rather coarsely and sparsely punctate. Elytra distinctly wider at base and much wider at middle than the prothorax, humeri obtusely rounded, umbone prominent, sides somewhat strongly arcuate; disc a little more coarsely punctate than prothorax, punctures without, or with faint tendency to serial arrangement, punctuation a little finer at apex. Ventral surface finely and sparsely punctulate, with short gray pile at extreme sides, darker at middle. Femora black, shining, with punctules bearing short gray pile; tibiae and tarsi piceous brown.

♂.—Antennal joints 2, 3, 4 subequal in length, 3 narrowest, 4 widest; 5 nearly as long as 3 and 4 combined, scarcely wider at apex than 4; 6 equal to 2; 7-11 about one-half wider than 4 and 5, 11 a little longer. Fifth ventral segment short, with a moderately deep, elongate deltoid depression at the middle and a small subtransverse tubercle each side at apex.

♀.—Antennal joints nearly as in *vittata*. Fifth ventral segment simple.

Length 1.8-2.0 mm.; width .9-1.0 mm.

Described from Oregon and Washington. Specimens studied from Portland, Oreg.; Auburn, Tenino, Wash.; Victoria, Vancouver Id., B. C.; Lo Lo, Mont., June 8, 1912.

In collections this species has been confused with *albionica* and *pusilla*, from both of which it may be distinguished by the male

characters and by the more robust oval form and coarser punctation, especially of the elytra. It is black with only faint metallic luster, and aside from color, it is more closely related to *vittata* than to *albionica*. E. T. Cresson, Jr., kindly informs the writer, what had been concluded from Horn's description, that the type is unmarked and that the specimens described as *decipiens ordinata* do not represent what is considered typical *decipiens*.

This species is reported attacking radish, turnip, sugar beet and potato.

18a. *Phyllotreta decipiens ordinata* n. var.

Of the same form and color as normal *decipiens*. The elytra bear each a very small, often indistinct dark red subapical spot and the disc is distinctly seriatly punctate. The latter is moderately convex with the punctures scarcely deeper or coarser but much more closely placed than on the prothorax and in quite regular rows or striae, feeble and less distinct at the sides and apex. Nearer the sides than the suture is the very small incurved red spot mentioned, sometimes indistinctly indicated. Ventral segments and femora about as in normal *decipiens*; tibiae reddish at the articulations, tarsi yellowish. Antennal joints about as in *decipiens*. Fifth ventral segment longer in ♂, with faint impression at apex.

Length 1.8 mm.; width 0.8 mm.

Type ♂.—Cat. No. 28,814, U. S. National Museum. Paratypes in the Canadian National Collection.

Elko, Nev. (Wickham); Bozeman, Lo Lo, Mont., June 8, 1912, June 27, 1906; Washington; Pocatello, Idaho; Portland, Oreg. (E. A. Schwarz).

Apparently different from others of this group by the more distinctly serial arrangement of the discal elytral punctures. The minute red subapical elytral spot is quite probably invisible in some individuals. In one, a female, there is also a subhumeral spot and in still another, a male, these two somewhat indistinct, though perfectly visible, spots show a decided inclination to become united. It is not impossible that perfectly vittate forms exist, that the species was originally definitely vittate and that such vittae have become obsolete or nearly so through melanism. In certain other characters this form appears different from the melanistic one, but these characters are of doubtful constancy.

19. *Phyllotreta albionica* (Lec.)

Haltica albionica Leconte, Pacific R. R. Rept., 1857, p. 68.

Phyllotreta albionica Lec., Horn, Trans. Am. Ent. Soc., 1889, p. 299, pl. VI, fig. 22.

Elongate oval, moderately convex, shining black with metallic luster, more or less aeneous. Antennae half as long as the body, slender, second, third and apical portion of the first antennal joints dark red, remainder black and densely gray pilose. Head feebly punctulate. Prothorax short and narrow, especially at apex, scarcely one-fourth wider than long, sides moderately arcuate, feebly narrowed at base; disc moderately convex, punctation relatively coarse and dense, but not deep. Elytra moderately narrow, suboblong, distinctly wider at base than the prothorax, humeri obtusely rounded; disc a little more coarsely and densely punctate than on prothorax, partially subrugose, less distinct at sides and apex. Ventral segments shining black, finely, distinctly punctate, punctures piliferous with very fine and rather long gray hairs widely separated in longitudinal and parallel rows. Femora black, finely punctulate, punctules piliferous gray; tibiae brown at the ends, also with piliferous gray punctules, tarsi yellow brown.

♂.—Antennal joints 2, 3, 4 subequal in length; 4 one-fourth wider, deltoid; 5 nearly one-third longer to twice as long as 4, less than one-third wider at apex, suboblong, less than one-third longer than wide; 6 subequal to 4; 7 a little wider and one-half longer than 6; 8–11 wider, about twice as wide as 3. Fifth ventral not sinuate, somewhat flattened at apex, each side of which is a small rounded tubercle. Pygidium visible, forming with the apex a poorly defined, rather shallow semicircle.

♀.—Antennal joint 6 much shorter than 3 and 4 combined. Fifth ventral simple without tubercles; gray pilosity of all segments more distinct than in ♂.

Length 1.5–1.9 mm.; width 0.7–0.9 mm.

Described from San Jose and San Diego, Calif., and recorded from Gallinos, Canyon, Clouderoft and Highrolls, N. Mex. Represented in specimens examined by the writer from localities in California, including Amedee, Altadena, Oxnard, Huntington, Squaw Valley, Los Angeles, Riverside, and Salinas; and in Montana, at Selway, Alzada, Glasgow, Assiniboine, Billings, Bear Paw Mt., Bozeman, Paw Paw Mts., Huntley and Blaine Counties. The following is added: The Dalles, Huntington, Oreg.; Govan, Auburn, Ritz-

ville, Lind, Sprague, Wawawai, Wash.; Colorado Springs, Delta, Fowler, Dolores, Paonia, Canon City, Custer County, Ft. Collins, Colo.; Sierra Ancha Mts., Ariz.; Argus Mountains, Nev.; Logan, Nephi, Promontory, Wellsville and Salt Lake City, Utah; Douglas and National Park, Wyo.; Blackfoot, Lethbridge, Idaho; Onefour, Medicine Hat, Alberta, Can., Vernon, B. C.

There are both published and unpublished records of injuries by this species to turnip, radish, cabbage, cauliflower, rutabaga, alfalfa and sugar beet. It feeds also on *Cleome integrifolia*. Early records of injury attributed to *Ph. albionica* are largely due to *Ph. pusilla*, since the latter was not described until 1899, while the former was known much earlier.

This species represents a well-defined group, the component parts of which are closely affiliated. These related forms, not hitherto described, have been confused in collections, even with species so diverse as *decipiens*, *pusilla* and others. The principal character that will separate the female *albionica* from most others with which it might be confused consists of the unusually heavy covering of fine gray pile proceeding from the punctures of the ventral segments.

The length and width of the male antennal joints, especially of 4 and 5, are subject to extreme variation. A series from Montana exhibits this strikingly. In these the fifth joint is quite strongly dilated, while in specimens from Washington State this joint is much smaller and narrower, scarcely more than half as wide in some examples. The fact that gradations occur, in a large series, makes it undesirable to assign a varietal name for a Montana form with the more strongly dilated fifth antennal joint.

19a. *Phyllotreta albionica corusca* n. var.

Elongate oblong-oval, more than twice as long as wide, moderately convex; elytra brightly shining metallic, faintly greenish-black, prothorax with more distinct greenish luster. Antennae fully half as long as the body, basal joints slender, apical joints more than twice as wide. Head distinctly, rather densely punctulate. Prothorax moderately convex, about one-fourth wider than long, much wider at the apex than the head, strongly unevenly arcuate at the sides, narrowed at the base; surface finely, not deeply, somewhat densely punctate. Elytra distinctly wider at base than the prothorax, rounded at humeri, unbone nearly invisible, sides parallel; surface more coarsely, irregularly and more densely punctate than the prothorax, nearly as coarsely at the sides, faintly at apex. Ventral segments moderately shining black;

finely, distinctly, rather densely punctate. Legs black.

♀.—Antennal joints 2, 3, 4 subequal in length and width; 5 longer than 3 and 4 combined, but not wider; 6 much shorter, but longer than 4; 7–11 fully twice as wide as 4. Fifth ventral segment moderately conical, slightly flattened near apex.

Length 1.6 mm.; width 0.7 mm.

Nicola Lake, B. C., August 13, 1920 (R. Hopping).

Type ♀.—Cat. No. 28,814, U. S. National Museum. One specimen.

The long fifth antennal joint indicates relationship to *albionica*, and the discovery of the male may determine the degree of this relationship.

20. *Phyllotreta herbacea* n. sp.

Elongate oval, moderately depressed, slender, a little more than twice as long as wide, dorsum metallic dark grass-green. Antennae half as long as the body, slender, first four and apical half of the fifth joint light red or yellow, apical joints dark fuscous. Head finely, regularly and densely punctulate. Prothorax about one-fourth wider than long, sides strongly arcuate, suddenly narrowed at base; disc moderately convex, punctures considerably coarser than on head, rather closely placed. Elytra moderately narrow, suboblong oval, distinctly wider at base than the prothorax, humeri subacutely rounded; disc subdepressed, more coarsely and densely punctate than the prothorax. Ventral segments shining black, distinctly punctate, the fifth more irregularly; surface scarcely pilose. Femora black, posteriorly finely punctulate, tibiae and tarsi fuscous.

♂.—Antennal joint 2 short; 3 slightly longer; 4 about one-fourth wider than 3, subovate; 5 elongate oval, still wider, fully one-half longer than wide, length equal to 3 and 4 together; 6 distinctly longer than 3, one-fourth shorter than 7, one-third longer than wide; 7–11 subequal in width, not forming a club. Fifth ventral segment not impressed at the sides, flattened with a large transverse tubercle each side; pygidium inflexed, forming a semicircular cavity.

♀.—Antennal joints 2, 3, 4 subequal; 5 a little shorter than 2 and 3 together and not wider; 6 long, but distinctly shorter than 7. Fifth ventral segment flattened, slightly acute at apex without tubercles.

Length 1.8 mm.; width 0.9 mm.

Dolores, July 20, 1906 (H. O. Marsh), Canon City, April 4 (H. Soltau), "Colorado" (Chittenden).

Observed by Marsh with *Ph. aeneicollis* feeding on turnip.

Type ♂.—Cat. No. 28,820, U. S. National Museum. Paratype in the Canadian National Collection and that of Mr. Carr.

Separable from *albionica* by the distinctly green dorsum and red or yellow basal antennal joints, the strongly arcuate and suddenly narrowed prothorax, with correspondingly wider base of the elytra, and the male antennal and ventral characters. Probably common locally and liable to be injurious; in which case it might in time extend its range in Colorado and to adjoining States.

21. *Phyllotreta prasina* n. sp.

Elongate oblong-oval, more than twice as long as wide, somewhat strongly depressed, elytra shining dark metallic green. Antennae fully half as long as the entire body, joints 2 and 3 and a portion of 1 ferruginous. Head somewhat finely, distinctly and densely punctate. Eyes moderate in size, prominent. Prothorax very narrow, nearly as long as wide, subparallel at sides, narrower at the apex than the eyes, much narrower at the base than the elytra; surface sparsely and a little more coarsely punctate than the head. Elytra narrow, subparallel at the sides, obtusely rounded at the humeri, umbone rather large, prominent; surface somewhat uneven, scarcely more coarsely punctate than the prothorax. Ventral segments shining black, moderately punctulate, sparsely but distinctly pilose with gray hairs.

♂.—Antennal joints 2, 3 subequal; 4 a little longer and very slightly wider at apex; 5 fully one-third longer and a little wider than 4; 6 subequal to 4; 7–11 not wider than 5. Fifth ventral depressed at sides, concave at extreme apex with a rather large prominent transverse tubercle each side.

♀.—Antennal joints 4 and 5 subequal in length and width; 7–11 wider and longer. Fifth ventral segment conical, without tubercles, but with strong setiform hairs at apex.

Length 1.2–2.1 mm.; width 0.7–0.9 mm.

Riverside, Calif., June 10, 1919 (C. F. Stahl); Los Angeles County (E. A. Schwarz), Kern County, Mojave, Calif. (A. Wetmore); Globe (D. K. Duncan), Argus Mts., May, 1891 (A. Koebele), Nogales, Ariz.; Brownsville, Benson, Cochise County (F. Knab), Tex.

Type ♂.—Cat. No. 28,797, U. S. National Museum. Paratypes in the Museum of Comparative Zoology, and the Canadian National Collection, and that of D. K. Duncan.

The form is quite similar to that of *pusilla*, but in the male antennae closer relationship is shown to *albionica*. The prothorax usually has a cupreous luster, and the elytra are generally bright metallic green, although exceptionally black. The fourth and fifth antennal joints in the male are smaller than in the latter, and the fifth is comparatively shorter and distinctly narrower.

This species is not rare and may at some future time prove injurious. Its food habits are unknown.

22. *Phyllotreta chalybeipennis* (Crotch)

Orchestris chalybeipennis Crotch, Proc. Ac. Nat. Sci. Phila., 1873, p. 67.

Phyllotreta chalybeipennis Crotch, Horn, Trans. Am. Ent. Soc., 1889, pp. 300, 301.

Elongate oval, moderately convex, bright blue, green or purple on dorsum, black on venter. Antennae longer than half the body, basal five joints yellow or rufotestaceous, apical joints mostly dark brown. Head sparsely, but very distinctly punctate. Prothorax about one-third wider than long, narrowed at apex, sides rather strongly irregularly arcuate; disc convex, alutaceous, moderately closely, but not coarsely punctate. Elytra scarcely wider at base than the prothorax, humeri obliquely rounded, punctation similar to that of the thorax and equally close, interspersed with much larger punctures, forming quite distinct striae near the base, five being very evident; surface irregular, not alutaceous. Ventral segments black, distinctly, sparsely punctate, sparsely pilose, hairs gray. Anterior and middle femora brown, posterior piceous with bluish green luster, punctulate apically, tibiae and tarsi pale brown, posterior tibiae more dilated than usual at apex.

♂.—Antennal joints 2 and 3 equal; 4 a little longer; 5 a little longer and wider than 4; 6 a little shorter than 5; 7–11 very little wider; 11 a little longer. Fifth ventral segment distinctly concave at the sides, truncate at apex, a distinctly impressed line extending from the base but not attaining the apex, a small transverse tubercular process each side at extreme apex. Pygidium inflexed at apex.

♀.—Antennae as in the male. Fifth ventral segment concave at sides, simple or feebly longitudinally impressed at apex, without tubercles.

Length 2.3–2.8 mm.; width 1.2–1.4 mm.

Described from New Jersey. Occurs commonly along the Atlantic seacoast from "Massachusetts to Florida," also in Bermuda.

A maritime form living on *Cakile edentula*, or sea-rocket, the leaves of which the larvae mine. The largest and most robust of all the species with simple antennae and unicolorous elytra. A beautiful and well-defined species, apparently limited to a single food plant.

23. *Phyllotreta aeneicollis* (Crotch)

Orchestris aeneicollis Crotch, Proc. Acad. Nat. Sci. Phil., 1873, p. 67.

Phyllotreta aeneicollis Crotch, Horn, l. c., p. 301.

Phyllotreta aeneicollis Crotch, Chittenden, Proc. Ent. Soc. Wash., v. 25, 1923, p. 136.

Elongate oval, moderately convex with shining metallic luster, with the appearance of slenderness and rather strong convexity; elytra variable from aeneous brown to blue, green, purple and cupreous to nearly black. Antennae moderately slender, half as long as the body, piceous, joints 2-5 and underside of first rufotestaceous, apical ones piceous. Head sparsely, indistinctly punctulate. Prothorax one-fourth wider than long, convex, narrowed in front, sides irregularly arcuate; punctation distinct, fine and dense, surface alutaceous. Elytra distinctly wider at base than the prothorax, humeri obtuse, disc rather strongly convex, the punctation coarser than that of the prothorax, punctures less closely placed but irregular, sometimes coalescing, becoming finer near the apex; near the base there are conspicuously larger punctures tending to form striae. Ventral segments black, sparsely punctate, subglabrous. Femora black, tibiae and tarsi brownish testaceous.

♂.—Antennae with joint 5 just perceptibly longer but not wider than 4 and 6; 7-11 subequally a little wider. Fifth ventral segment strongly concave at sides, feebly impressed at apex, usually without tubercles, when present minute and rounded, situated closely together inside the impression. Pygidium strongly inflated and plainly visible beyond the last segment.

♀.—Antennae as in the male. Fifth ventral segment simple.

Length 1.2-2.0 mm.; width 0.6-0.9 mm.

The sexes may be separated easily by the presence or absence of the concavity on each side of the fifth ventral. In the male the apical impression, as well as the tubercles, are not constant.

Described from Texas. This species has a range from Rocky Ford, Ft. Collins, Dolores, Colo., and Elk Point, S. Dak.—the most

northern locality—southward to Baton Rouge and Berwick, La. It occurs south to Brownsville, Tex., and is fairly common in the States mentioned; also recorded from Clouderoft, N. Mex. (Cockrell and Fall).

Most specimens from Texas and Louisiana are brown aeneous, although green individuals are not uncommon. Colorado specimens are occasionally green but most have a distinctly blue luster and less seldom purplish.

Three color varieties may be indicated, as follows:

Head and prothorax bright cupreous or aeneous; elytra blue, seldom green or black; Kans., Colo., S. Dak.	a	typical <i>aeneicollis</i>
Dorsum unicolorous, metallic aeneous brown, dark green, black or purple with aeneous luster; La., Tex.	b	variation
Head and prothorax metallic green or purple, elytra blue, seldom green, without aeneous luster; Colo.	c	variation

Reported on turnip, radish and cabbage in Colorado and injurious to the foliage of mustard and turnip in gardens in Louisiana. The larva is a leaf-miner on *Lepidium virginicum* and *Coronopus didymus*. According to H. O. Marsh, this species also occurs on *Cleome*.

24. *Phyllotreta lewisii* (Crotch)

Orchestris lewisii Crotch, l. c., p. 66.

Phyllotreta lewisii Crotch, Horn, l. c., p. 301, 302.

Elongate oblong-oval, moderately depressed, dorsal and ventral surface dark blue, exceptionally blue black or black. Antennae slender, distinctly more than half as long as the body, dull piceous, joints 2-5 and apex of 1 pale. Head feebly, sparsely and irregularly punctate. Eyes moderately prominent. Prothorax about one-third wider than long, slightly narrowed at apex, sides moderately arcuate, disc convex, punctures rather deep, moderate in size, somewhat sparsely placed, surface not alutaceous. Elytra scarcely wider at base than the prothorax, basal three-fourths subparallel, humeri broadly rounded, disc convex, the punctures a little coarser than those of the thorax, and more closely placed, finer toward the apex. Ventral segments feebly shining to subopaque, very finely and sparsely punctate, distinctly pilose, hairs black and short. Femora black, tibiae

and tarsi piceous or brown.

♂.—Antennal joints as in *aeneicollis*, apical ones fully twice as wide as 2 or 3. Fifth ventral segment distinctly sinuate each side, rather deeply and widely concave at apex with a small depressed tubercle widely separated at each side.

♀.—Antennal joints as in the male. Fifth ventral segment with or without a faint impression at apex, without tubercles.

Length 1.9–2.7 mm.; width 0.8–1.1 mm.

Described from Colorado and Illinois; Horn added Texas, Nevada and California. Specimens have been seen from Rocky Ford, Fort Collins, Greeley, Longmont, Pleasant Valley, Cadoa, Colorado Springs, Debeque, Denver, Colo.; Williams, Flagstaff, Winslow, Santa Rita Mts., Ariz.; Gallup, N. Mex.; Monroe, Salt Lake City, Utah; Dallas, Ontario, Oreg.; Wawawai, Wash.; Cheyenne, Wyo.; Morton Co., Decatur Co., Kans.; Lafayette, Ind.; Moscow, Iowa City, Iowa; Cypress Mills, Tex.; Bladensburg, Md. The last locality may be accidental or erroneous.

Specimens of this common species were collected by Titus on sugar beet, alfalfa, Cleome and "skunkweed" in different regions of Colorado and Utah. At Rocky Ford, Colo., Marsh collected beetles on *Cleome serrulata* and obtained the larva on the roots of this weed. It does not appear to be recorded on any of the Cruciferae, but undoubtedly attacks them.

25. *Phyllotreta columbiana* n. sp.

Elongate oval, fully twice as long as wide, moderately convex; prothorax with distinct green luster; elytra shining, very dark blue. Antennae slender, fully half as long as the body, black, basal joints 2, 3, 4 and part of 1 paler. Head moderately wide, eyes prominent; surface distinctly sparsely punctate. Prothorax small, one-third wider than long, strongly narrowed at apex, wide at base, producing with the front of the head a triangular appearance, feebly arcuate at the sides; disc convex, surface distinctly, somewhat regularly, finely and distinctly punctate with punctures closely placed. Elytra scarcely wider at base than prothorax; sides subparallel in basal three-fourths; humeri inconspicuous; umbone small, not prominent; disc convex, punctures a little coarser than on prothorax with tendency to serial arrangement near base, scarcely finer toward apex. Ventral segments very feebly and sparsely punctate and pilose, hairs black. Femora shining black, feebly and sparsely punctulate, tibiae and tarsi opaque black.

♂.—Antennal joints 2–6 subequal in length and width, 7 a little wider, 8–10 about twice as wide as 3; 11 longer. Fifth ventral segment slightly transversely concave at sides, thickened each side at apex, flattened but scarcely concave at extreme apex with a minute tubercle each side.

♀.—Antennae as in the male. Last ventral simple, usually without tubercles.

Length 1.8–2.3 mm.; width 0.8–1.1 mm.

Agassiz, British Columbia, Canada, June 27–July 3, 1923 (R. Glendenning, Canadian National collection).

Type ♀.—Cat. No. 28,795, U. S. National Museum. Paratypes in the Canadian National collection.

Separable from *lewisii* by the characters tabulated, also by the narrower head and prothorax, more prominent eyes and shorter antennae. The male secondary sexual characters are less distinct, the last abdominal segment is scarcely or feebly impressed at the apex and the tubercles are less constant. It is related to the European *nigripes* and *atra*, agreeing with the latter in the sublinear arrangement of the elytral punctation. In *atra* the dorsum is entirely black, the fifth ventral segment ♂ bears at the apex a distinct, more or less prominent tubercle each side, while the apex ♀ is more or less strongly produced and without tubercles.

26. *Phyllotreta subnitida* n. sp.

Elongate oval, a little more than twice as wide as long, moderately convex, rather dull polished black without metallic luster. Antennae very slender, scarcely half as long as the body, basal joints 2 and 3 and portions of 1 and 4 dull reddish. Head short, narrow, surface indistinctly and sparsely punctulate, smooth on vertex; eyes small, not prominent. Prothorax short, moderately convex, nearly one-third wider than long, narrowed and scarcely wider at the apex than the head, moderately irregularly arcuate at the sides, widest at the basal third, somewhat feebly narrowed at the base; surface finely, not deeply, rather irregularly punctate, punctures moderately closely placed. Elytra long, narrow, very little wider at the base than the prothorax, humeri obtusely rounded, umbone not prominent, sides rather feebly and evenly arcuate, punctation coarser than on the prothorax, lighter and sparser at the side margins and apex. Ventral segments shining black, finely, feebly punctulate, punctules bearing sparse, short black hairs at middle and gray at sides. Femora black, rather sparsely gray pilose, tibiae piceous, tarsi pale fuscous.

♂.—Antennal joints 2, 3, 4 subequal in length; 2 wider than three or four; 3 slightly longer; 5 about one-fourth longer than 4 or 6; 7 scarcely wider; 8–11 a little wider than preceding, subequal in length, 11 a little longer. Fifth ventral segment subtruncate and flattened or slightly concave at apex, with or without transverse tubercles.

♀.—Antennae as in the male. Fifth ventral segment feebly concave at the sides, apex conical without tubercles.

Length 1.8 mm.; width 0.8 mm.

Pasadena, Calif. (A. Fenyès); Torrance Co., N. Mex. (J. R. Douglas); Esmeralda Co., Nev. (F. W. Nunenmacher).

Type ♂.—Cat. No. 28,818, U. S. National Museum.

Somewhat similar in general appearance to *pusilla*, agreeing rather closely in size, antennal structure, and in the prothoracic and elytral punctation. The prothorax, however, is larger and wider than in the latter, and the color is uniformly rather dull polished black without distinct metallic luster, whereas *pusilla* is usually distinctly shining cupreous or aeneous. It is of rather remarkable dimensions with its short prothorax and long narrow elytra.

27. *Phyllotreta aerea* Allard

Phyllotreta aerea Allard, Bull. Soc. Ent. France, 1859, p. C; Heikertinger, Halticinae, Käfer d. Deutsch. Reiches, IV, 1913, p. 177; Chittenden, Proc. Ent. Soc. Wash., 1926, pp. 139–142.

Phyllotreta punctulata Foudras, Ann. Soc. Linn. Lyon, ser. 2, 1859–1860, pp. 255, 257.

Elongate oval, not more than twice as wide as long, moderately convex, moderately polished black, with rather faint metallic, more or less aeneous luster. Antennae very slender, slightly more than half as long as the body, first three basal joints as viewed from lower surface light yellowish red. Head narrow; surface distinctly, very finely and somewhat densely punctulate; eyes rather large but not prominent. Prothorax moderately convex, long, nearly one-third wider than long, feebly narrowed, a little wider at the apex than the head, moderately arcuate at the sides, widest near the middle, feebly narrowed at the base; surface finely, regularly and sparsely punctate. Elytra wide, distinctly wider at the base than the prothorax, humeri abruptly rounded, umbone not prominent, sides moderately and evenly arcuate, punctation about as on the prothorax, finer at the apex. Ventral segments shining black, finely, rather densely punctulate,

punctules with very fine, sparse gray hairs only. Femora black, faintly pilose with gray; tibiae piceous, brown at articulations; tarsi pale fuscous.

♂.—Antennal joints 2, 3, 4 subequal in length; 2 slightly wider than 3; 3 slightly shorter; 5 about one-fourth longer than 4 or 6; 7 scarcely wider; 8–11 a little wider than preceding, scarcely more than twice as wide as 2, 3, 4, subequal in length, 11 a little longer. Fifth ventral segment subtruncate, transversely concave across the middle, not flat but with a ridge at the apex, tubercles wanting or rather indefinitely indicated.

♀.—Antennae about as in the male. Fifth ventral segment feebly concave at sides, apex conical without tubercles. Length 1.4–2.2 mm.; width 0.7–1.1 mm.

Rochester, N. Y. (R. L. Michaud, D. E. Fink); southern and southcentral Europe.

This species is related to *subnitida* with which it agrees in certain structural features. It is, however, more perfectly oval, with a larger prothorax and proportionately shorter elytra, the eyes are larger and more prominent, the humeri abruptly rounded, and the elytral punctation is finer. The ventral punctules bear fine gray, instead of black, hairs and the last segment is distinctly different in the male.

Introduced from Europe and reported from 1919 to 1921 destroying seedling radish, turnip and cabbage in the vicinity of Rochester, N. Y. The species is capable of breeding on probably most other Cruciferae since it has been recorded as feeding in Europe on *Sisymbrium*, *Sinapis*, *Armoracia*, *Reseda* and *Bunias*.

28. *Phyllotreta inconspicua* n. sp.

Elongate oblong-oval, twice as long as wide, convex, shining black on dorsal and ventral surfaces, with nearly uniformly faint greenish luster, form convex. Antennae slender, less than half as long as the body, opaque piceous black, joints 2, 3, 4 paler. Head narrow; surface finely and very sparsely punctulate. Eyes large, widely separated and prominent. Prothorax short, nearly as long as wide, moderately convex and moderately areuate at the sides, wider at the apex than the head; surface finely, not deeply, irregularly and sparsely punctulate. Elytra not much wider at base than prothorax, basal three-fourths or more subparallel; umbone small, not prominent; surface a little coarser and less sparsely punctate than on prothorax, without tendency to serial arrangement. Ventral surface black, finely and

very sparsely punctulate, subglabrous. Femora shining black, tibiae and tarsi opaque black.

♂.—Antennal joints 2, 3, 4 subequal in length; 3, 4 very slender; 5 slightly longer than 4 or 6; 7–11 three times as wide as 2 or 3. Fifth ventral segment rather widely flattened, scarcely concave at apex, with a minute tubercle each side.

♀.—Antennae as in the male. Fifth ventral segment not flattened, with obsolete tubercle at apex.

Length 1.3–1.5 mm.; width 0.7–0.8 mm.

Medicine Hat, Alberta, Canada, March 29, August 6, 1913 (F. S. Carr); Saskatoon, Saskatchewan (Kenneth M. King); Aweme, Manitoba, June 19, 1917 (N. Criddle); Wawawai, Wash. (M. C. Lane).

Type ♀.—Cat. No. 28,801, U. S. National Museum. Paratypes in the Canadian National collection and in that of F. S. Carr.

This species is smaller than the two to which it is most nearly affiliated, *lewisii* and *columbiana*, from which it may be distinguished by the characters in the table. One example is blue and one is much slenderer than the type but does not differ otherwise. This is an inconspicuous form, variable in outline and proportions.

29. *Phyllotreta fulgida* n. sp.

Elongate oval, about twice as long as wide, convex, brightly shining black with metallic luster; form convex. Antennae slender, a little more than half as long as the body, first four basal joints, as viewed from below, pale red, apical joints piceous. Head wide, feebly and sparsely punctulate. Eyes rather large, prominent, widely separated. Prothorax large, distinctly convex, scarcely one-fourth wider than long, not much wider at the apex than the eyes, somewhat strongly arcuate at the sides, a little narrower at the base than near the middle; surface distinctly and somewhat coarsely punctate. Elytra scarcely wider at base than the prothorax, humeri and umbone not prominent, sides moderately arcuate; punctation slightly coarser than on the prothorax, finer at the sides and fainter at the apex. Ventral segments moderately shining black, finely punctulate, feebly pilose. hairs recumbent, long and gray at the sides. Femora black with gray piliferous punctules; tibiae and tarsi testaceous.

♂.—Antennal joints 2, 3, 4 subequal in length; 5 and 6 subequal, one-fourth longer; 7–11 about twice as wide as the basal joints. Fifth ventral segment impressed at the sides, apex flattened, scarcely concave with a distinct transverse tubercle each side. Pygidium inflexed.

♀.—Fifth ventral segment simple without tubereles.
Length 1.6–2.1 mm.; width 0.75–1.0 mm.

Type ♂.—Cat. No. 28,811, U. S. National Museum. Paratypes in the Canadian National collection.

Canon City, Colo. (Wickham); Bright Angel Camp, Ariz., 6,900 ft. elevation, July, 1915 (Wickham); Hilton Creek, Sierra Nevada Mts., Calif., June 17, 1922; California (Chittenden); "N. M." (Canadian National collection).

A moderately distinct species of variable shades of color and of outline, confused in collections with *pusilla*. The larger and more convex prothorax with its more arcuate sides readily separate it from that species. Furthermore, there are no tubereles at the apex of the last ventral segment in the female. Some specimens have a faint greenish luster and one is faintly aeneous.

30. *Phyllotreta transversovalis* n. sp.

Robust oval, less than twice as long as wide, convex, elytra shining blue black with faint metallic luster, lower surface dark brown. Antennae very slender, fully half as long as the body, second, third and fourth basal joints and apical half of first pale yellow brown, remainder opaque piceous. Head rather wide, impunctate. Eyes of moderate size, not prominent. Prothorax large, about one-third wider than long, at apex narrowed and scarcely wider than the head, strongly arcuate at the sides, wide at base; surface finely and sparsely punctate. Elytra short, at base scarcely wider than prothorax, moderately arcuate at sides, umbone small; surface scarcely more coarsely or densely punctate than on the prothorax, punctures much finer and sparse on the sides and at apex. Ventral segments finely punctate, fifth more coarsely, glabrous. Femora, tibiae and tarsi pale brown.

♂.—Antennal joints as in *aeneicollis*. Fifth ventral segment somewhat faintly and narrowly impressed each side, at middle more deeply impressed, forming a large transverse oval concavity extending nearly to the base of the segment, bearing tubereles each side at apex.

♀.—Not seen.

Length 1.3 mm.; width 0.8 mm.

Milford, Utah, July 17 (Wickham).

Type ♂.—Cat. No. 28,804, U. S. National Museum. Unique.

The short oval form, convex transversely oval prothorax and large transversely oval fifth segment of the male distinguish this

species from others in this group. The unique male is evidently slightly immature, but is otherwise perfect.

31. *Phyllotreta brevipennis* n. sp.

Oval, less than twice as long as wide, depressed, dorsum rather feebly shining; prothorax dark aeneous green; elytra black without color luster. Antennae half as long as the body, joints very thick, second and third and apex of first red. Head wide, nearly impunctate; eyes small, prominent, widely separated. Prothorax large, more than one-third as long as the elytra, one-fourth wider than the length, feebly convex, narrower at base than the head, strongly irregularly arcuate at sides; surface finely, distinctly and densely punctate. Elytra scarcely wider at the base than the prothorax at its widest part, humeri and umbone inconspicuous, the latter hardly visible, sides feebly arcuate; surface a little more coarsely, much more sparsely punctate, punctures finer and sparser at sides and apex, without tendency to serial arrangement. Ventral segments feebly shining black, minutely punctulate, distinctly, sparsely pilose with white hairs at the sides. Femora black, tibiae reddish brown at ends, tarsi pale brown.

♂.—Antennal joints 2, 3, 4 subequal; 5 distinctly, but not much longer than preceding; 6 a little shorter, scarcely longer than 4, 7-11 slightly wider. Fifth ventral segment concave at sides, flattened at apex with a long transverse tubercular process each side.

♀.—Not seen.

Length 1.7 mm.; width 0.75 mm.

Aweme, Manitoba, Canada, October 11, 1916 (N. Criddle).

Type ♂.—Cat. No. 28,816, U. S. National Museum. Paratype in the Canadian National collection. Two specimens.

Remarkable for the short oval body; finely, distinctly and densely punctate pronotum; very thick, nearly uniformly wide antennal joints and the transverse tubercular processes at the apex of the last ventral segment in the male.

32. *Phyllotreta pusilla* Horn (Pl. II, fig. 8)

Phyllotreta pusilla Horn, Trans. Am. Ent. Soc. 1889, p. 302; Chittenden and Marsh, Bul. 902, U. S. Dept. Agr., 1920, pp. 1-21; Chittenden, Proc. Ent. Soc. Wash., v. 25, 1923, pp. 138, 139.

Elongate ovate, strongly depressed, dorsum distinctly cupreous or aeneous, exceptionally black or nearly so. An-

tennae slender, half as long as the body, piceous, joints 2 and 3 paler. Head scarcely visibly punctate. Prothorax very narrow, less than twice as wide as long, widest at middle, sides arcuate, apex slightly narrower than base; disc moderately convex, punctures fine and closely placed. Elytra wider than the prothorax, humeri obtuse, punctation a little coarser than that of the prothorax, closely placed, very little finer near the apex, but less dense. Pygidium inflexed and visible from ventral surface. Ventral segments black with cupreous or aeneous luster, sparsely punctate, not pilose. Femora black with aeneous luster, tibiae and tarsi dark brown.

♂.—Antennal joints 2, 3, 4 subequal in length; 5 and 6 slightly longer, but not much wider; 7-11, each about twice as wide as 2, forming a 5-jointed club. Fifth ventral segment impressed at the sides, more or less concave at the middle, distinctly linearly impressed at the apex, the impression either very short and narrow or longer and narrowly subdeltoid, with a small rounded, or, exceptionally, a transverse tubercle each side, usually somewhat closely placed together.

♀.—Antennal joints about as in the male. Fifth ventral segment impressed at the sides, feebly concave, not linearly impressed at the middle and with a minute tubercle each side, more closely placed together.

Length 1.2-1.7 mm.; width 0.6-0.8 mm.

The sexual characters of this species are even more flexible than indicated in the foregoing description. When the pygidium is strongly inflexed, this gives to the extreme apex of the fifth ventral segment the appearance of an oval concavity. The apical tubercles are sometimes transverse in both sexes. Since the females of this species and of *albionica* are so similar, both being injurious with a similar although not identical distribution, it may be stated that in the latter the fifth antennal joint is as long as the third and fourth together, the ventral segments are more distinctly pilose and the fifth ventral is without tubercles. In *pusilla*, on the contrary, the fifth antennal joint is shorter than the third and fourth together, the ventral segments are glabrous, and the fifth ventral segment is usually distinctly tuberculate in both sexes. A series of this species collected in Torrance Co., New Mexico, September, 1926, by J. R. Douglass, is worthy of mention. Some of the males have no tubercles whatever on the fifth ventral segment, and the apex only is finely, linearly impressed; some of these also have no lateral impressions.

Phyllotreta pusilla is known as the western cabbage flea-beetle and is the most injurious species of the genus. It is widely distributed in the Rocky Mountain region, especially abundant in Colorado and New Mexico, and occurs eastward and westward in Arizona, California, Washington, Montana, Wyoming, Idaho, Nebraska, Oklahoma, Kansas, and ranges southward through Brownsville, Tex., into Mexico. It frequently occurs at high altitudes and is a permanent inhabitant of lower areas. It is evidently a Sonoran form.

The western cabbage flea-beetle, although principally an enemy of cruciferous plants, has often been observed and recorded as injuring sugar beets and other vegetable crops. Turnips, mustard and radish are decidedly the favorite food plants. In the Arkansas Valley of Colorado, and elsewhere, the beetles attack these and frequently injure all of the Cruciferae, including cabbage, cauliflower, watercress, Chinese cabbage or pe-tsai, horse-radish, rape, nasturtium, beeplant (*Cleome serrulata*), sweet alyssum, candytuft, peppergrass (*Lepidium* spp.), hedge mustard (*Sisymbrium* spp.), wild watercress (*Radicula* spp.), and tansy mustard (*Sophia pinnata*), all normal food plants. When the beetles occur in great abundance they attack and injure also lettuce, beans, peas, carrot, tomato, potato, corn, table beet and mangel-wurzel.

Injury is due to the beetles eating pit-like holes in the leaves of young plants, usually selecting the lower surface. Radish is so seriously attacked practically everywhere within the destructive range of this pest that, at times, it is almost impossible in such regions to grow this vegetable unless strenuous efforts are made to prevent inroads.

33. *Phyllotreta laticornis* n. sp.

Elongate oval, more than twice as long as wide, little narrower anteriorly, moderately convex, shining dark aeneous. Antennae half as long as the body, black, second and third joints paler and very slender, apical joints much thicker. Head distinctly, rather densely and finely punctate. Eyes not prominent. Prothorax strongly convex, one-third wider than long, narrowed at apex, where it is slightly wider than the head, sides arcuate in apical half, subparallel in basal portion; surface densely and finely aciculate punctate. Elytra narrow suboblong, nearly twice as long as wide, at base scarcely wider than prothorax, humeri rounded, not prominent, umbone subobsolete, sides feebly arcuate, surface

moderately uneven, slightly more coarsely punctate than on prothorax, less distinctly and less densely at apex. Ventral segments feebly shining cupreous, distinctly subseriately punctate, strongly coated with fine widely-separated recumbent white pile. Femora black, tibiae piceous and brown, tarsi brown.

♂.—Antennal joints 2, 3, 4 subequal in length; 5 and 6 a little longer, subequal; 7–11 about three times as wide as 3; 11 longer. Fifth ventral segment narrowly and transversely concave, concavity shallow, bearing a small transverse tubercle each side. Pygidium visible.

♀.—Antennae as in male. Fifth ventral segment flat at apex with a smaller tubercle each side.

Length 1.5–2.1 mm.; width 0.7–0.9 mm.

Sierra Anca Mts., Ariz., July (D. K. Duncan).

Type ♂.—Cat. No. 28,807, U. S. National Museum. Paratype in the collection of D. K. Duncan.

This species is quite distinct, differing markedly from all others in structure. It is not even distantly related to *pusilla* but is merely placed near it for tabulation. The color is the same but it is larger, more convex, with wider prothorax and the apical antennal joints are especially thicker. The very distinct punctation of the dorsum and of the ventral segments together with the pilosity of the latter are worthy of note. The sexual differences are not especially strong or entirely constant.

34. *Phyllotreta viridicyanea* n. sp.

Elongate oblong-oval, a little more than twice as long as wide, strongly depressed, elytra moderately shining dark metallic blue-green. Antennae half as long as the body, basal joints very slender, the first four and part of fifth joint bright yellow. Head purple aeneous, very feebly punctulate; eyes rather small, not prominent. Prothorax aeneous green, scarcely wider than long, slightly wider at apex than head, arcuate at the sides; feebly convex, finely, rather densely punctulate. Elytra oblong, wider at base than prothorax, humeri rounded, umbone rather large but not prominent, sides subparallel; surface even, punctation nearly as on prothorax but a little coarser. Ventral segments subopaque black, without metallic luster, nearly smooth, feebly pilose with white hair. Posterior femora black, tibiae and tarsi yellow brown.

♂.—Antennal joints 2, 3, 4 subequal; 5 about one-half longer than 4, not wider; 6 a little shorter, 7–11 about one-

half wider than preceding and twice as wide as the basal joints; 11 a little longer. Fifth ventral segment impressed in apical half, impression distinct but moderately narrow and rather shallow, without tubercles.

♀.—Antennae as in the male, except joint 5, which is a little shorter. Fifth ventral segment flattened at extreme apex, without tubercles.

Length 1.9 mm.; width 0.8 mm.

Kaweah, Tulare Co., Calif., 1,000 ft. elevation (R. Hopping); Amadee, Calif., July 21, 1882, 4,200 ft. elevation (Wickham).

Type ♀.—Cat. No. 28,813, U. S. National Museum.

Except for the antennal characters of the male, this species resembles *prasina*, especially in its bright green luster. The allotype is less brightly colored than the female. A female from California agrees with the description, except that the dorsum is aeneous. The basal antennal joints vary from bright yellow to red. An attractively colored species.

35. *Phyllotreta polita* n. sp.

Elongate oval, twice as long as wide, moderately convex; elytra polished jet black with greenish, aeneous or darker metallic luster; prothorax shining black. Antennae slender, half as long as the entire body, joints 1–6 flavotestaceous, apical ones piceous. Head sparsely punctulate, interocular fovea on vertex minute; eyes large, prominent. Prothorax strongly convex, about one-fourth wider than long, moderately regularly arcuate at sides, much narrowed apically; surface finely sparsely punctate, not alutaceous. Elytra distinctly wider at base than prothorax, humeri very broadly rounded, umbone not prominent; surface more coarsely and densely punctate than on the prothorax, punctures regularly, nearly uniformly placed on disc, less regularly on sides and more faintly at apex. Ventral segments shining black, finely sparsely punctulate, glabrous. Femora pale yellow-brown at extreme apex, tibiae and tarsi pale fuscous.

♂.—Antennal joints 2, 3, 4 subequal; 2 scarcely longer than wide; 5 about one-third longer than 4 or 6; 7–11 subequal, about one-third wider than preceding but much wider than basal joints; 11 a little longer. Last ventral segment with a large deep subdeltoid concavity at apex, without distinct tubercles. Pygidium not strongly inflexed, scarcely visible from ventral surface.

♀.—Antennae about as in male. Last ventral segment conical, simple, without trace of tubercles.

Length 1.8–2.1 mm.; width 0.8–1.1 mm.

Corvallis, Oreg. (G. F. Mozzette) ; Leeds, Utah (Wickham).

Type ♂.—Cat. No. 28,796, U. S. National Museum. One male and one female.

The distinguishing features are the highly polished black color of the dorsum, on which an equally distinct color luster may be seen in a good light, doubtless due to the rather deep and regular punctation of the same, and the large and deep deltoid concavity at the apex of the last ventral segment in the male.

36. *Phyllotreta inordinata* n. sp.

Oval, a little less than twice as long as wide, varnished black, prothorax brightly shining with bluish or other luster. Antennae nearly half as long as the body, basal joints slender, mostly moderately bright yellow, apical joints darker, successively wider. Head and eyes prominent, head nearly smooth, very feebly punctulate. Prothorax long, about one-fourth wider than long, a little wider at apex than the head, strongly, irregularly arcuate at the sides; surface finely and sparsely punctulate. Elytra wider at base than prothorax, humeri subacutely rounded, umbone nearly obsolete, basal three-fourths of sides subparallel, apex subtruncate; surface finely, but a little more coarsely and more densely punctulate than the prothorax, not much finer at sides, but finer at apex. Ventral segments feebly and sparsely punctate, moderately shining and subglabrous. Femora feebly shining black, tibiae and tarsi dull yellow.

♂.—Antennal joint 2 short; 3 and 4 longer; 5 still a little longer; 6 about one-third shorter than 5; 7-11 about twice as wide as joints 2, 3, 4; 11 a little longer than preceding. Fifth ventral segment feebly concave at sides and at extreme apex, latter concavity small and circular in outline, without tubercles.

♀.—Antennal joints similar to ♂. Fifth ventral segment conical at apex, sparsely finely pilose, hairs black.

Length 1.7 mm.; width 0.9 mm.

San Antonio, Tex., June 22, 1895 (H. Soltau); Brownsville, Tex., April 30, 1904 (H. S. Barber); Texas (Belfrage); Globe, Ariz. (D. K. Duncan).

Type ♀.—Cat. No. 28,811, U. S. National Museum. Paratype in the Canadian National collection.

This species is rather notable for its lack of conspicuous features; summarized, the most noticeable are: Its varnished, rather than highly polished, black color, evidently due to the feeble punctation,

its large prothorax, and feebly developed secondary sexual characters, especially notable in the fifth ventral segment of the male.

Addendum

Phyllotreta undulata Kutsch is of doubtful occurrence in this country and *Ph. lindahli* Dury is not believed to be a real *Phyllotreta*. The types of this latter have not been seen, and Mr. Dury is not certain of the genus. Brief descriptions of these species, however, are furnished in this addendum.

Phyllotreta undulata Kutsch

Haltica undulata Kutsch, Wien. Entom. Monatschrift, 1860, p. 301.

Phyllotreta undulata Kutsch, Chittenden, Proc. Ent. Soc. Wash., 1923, p. 134.

Elongate oval, moderately convex, moderately shining black, feebly aeneous; elytral vitta broad, yellow, slightly incurved at base, subparallel on sutural margin to near apex, thence recurved toward but not reaching the suture, antennae about half as long as body, opaque black, 2 or 3 basal joints wholly or in part testaceous. Head punctate about as in *vittata*. Elytra distinctly wider at base than prothorax, humeri not prominent, punctures of disc as in *vittata* but with somewhat less tendency to strial arrangement; vitta slightly wider in basal fifth without subhumeral branch, narrower and subparallel in middle three-fifths, wider in apical fifth. Ventral surface including femora black, tibiae and tarsi more or less testaceous.

♀.—Fifth joint of antennae very little longer than fourth or sixth, sixth shorter than seventh. Last ventral simple.

Length 1.8 mm.; width 0.8 mm.

This species has been mentioned by the writer (l. c.) as having been taken at Bladensburg, Md. Two specimens are at hand so labeled, but it is doubtful if the species has been established in this country.

Phyllotreta lindahli Dury

Phyllotreta lindahli Dury, Jour. Cinn. Soc. Nat. Hist., 1906, p. 254.

Elongate oval, convex, black, shining. Thorax wider than long, minutely alutaceous. Punctures fine, becoming coarser towards base. Elytra wider at base than thorax, with humeri rounded. Disk coarsely punctured, with a faint strial

arrangement. Tibiae, tarsi and antennae (except the last four joints of antennae, which are piceous) pale.

♂.—Last ventral segment rounded at tip with a deep rounded depression, which extends forward in triangular shape through the entire length of the penultimate segment. In bottom of the depression is a groove extending its length. There are two minute tubercles at bottom of depression near apex of last segment.

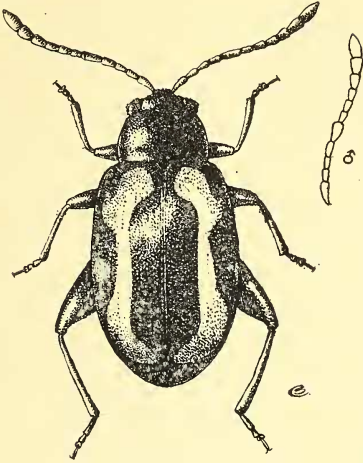
♀.—Last ventral segment with a shallow fovea near tip. Obliterated in one specimen. This species comes nearest *lewisii*.

Four specimens 2.5 mm.; Cincinnati, Ohio, May 30 (Dury).

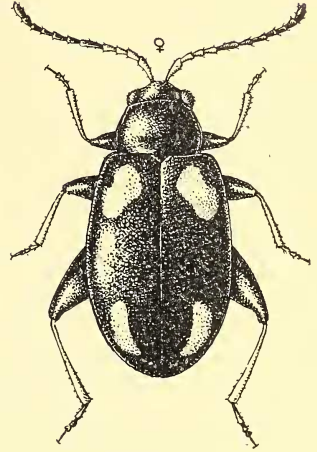
The generic status of *Ph. picta* = *Trachymetopa picta* Say is given by Heikertinger, "Die Halticinengenera der Palaearktis und Nearktis, Bestimmungstabellen, 1925," p. 58. Possibly *Ph. lindahli* may belong to *Tanygaster* Blatch (Heik., p. 59). Dury (in lit.) had previously expressed this opinion.

PLATE I

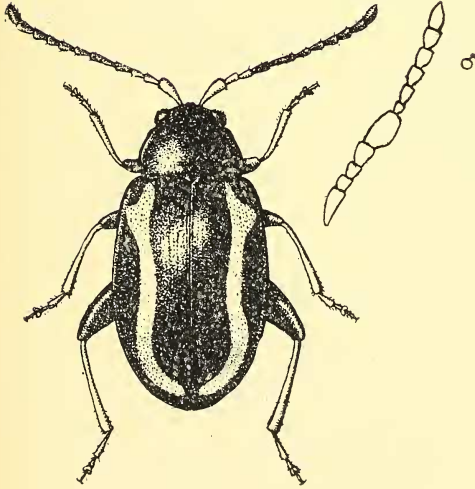
- Pl. I, fig. 1—*Phyllotreta vittata*
2—*Phyllotreta (vittata) discedens*
3—*Phyllotreta zimmermanni*
4—*Phyllotreta liebeccki*



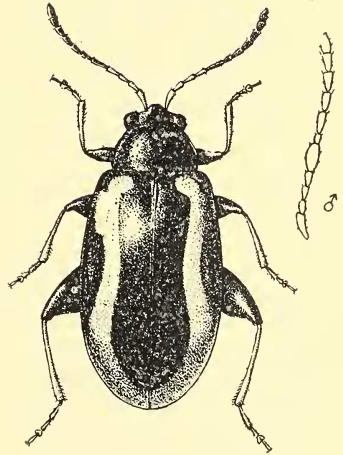
1



2



3



4

PLATE II

- Pl. II, fig. 5—*Phyllotreta oblonga*
6—*Phyllotreta oblonga*
7—*Phyllotreta bipustulata*
8—*Phyllotreta pusilla*